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MARCH, 1904. VOL. XXIII. NO. 3.

The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.

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Geographical Journal.

No. 3. MARCH, 1904. Vol. XXIII.

RECENT EXPLORATION AND ECONOMIC DEVELOPMENT IN CENTRAL AND WESTERN CHINA.*

By Lieut.-Colonel C. C. MANIFOLD, I.M.S.

In the address which I have the privilege of delivering to you this evening, on some recent exploration work in Central and Western China, the part of the country to which I wish to draw your attention is the upper Yangtse valley, and in particular to its rich and fertile province of Sechuan.

On the two journeys made by me to these regions, my respective starting-points were some thousands of miles apart from each other, in the one case being Burma, and in the other Peking, and the intermediate distance covered to reach the upper Yangtse, as well as routes traversed in its basin and on the return journey, amounted to nearly 6000 miles of land travel on foot, and 3000 on inland waterways by junk and boat. I will, therefore, only dwell briefly on the regions outside Sechuan, although nearly every day's march possessed points of interest apart from those which in normal states of the country in ordinary years would have presented themselves to the traveller, for the first journey was made in 1900, immediately before and during the "Boxer" outbreak, and the second was made immediately after it, on the evacuation of Peking by the allied forces, so that an opportunity was afforded of seeing the country under very unique conditions. This will be the first audience I shall have had the honour of addressing on the Sechuan portion, and, with your permission, I will make a start to-night in the upper Yangtse valley, and will first point out to you

* Read at the Royal Geographical Society, November 23, 1903. Map, p. 420.

some of its geographical features, particularly with reference to the rich districts of the Sechuan basin, which, with its population of nearly fifty millions, with its numerous industries and great agricultural and mineral wealth, presents such important problems to us, not as students only, but as inhabitants of the British Isles, whose national prosperity is so dependent on our being able to provide fresh markets for our trade as old ones become exhausted or closed.

How closely geographical and commercial aspects are connected may be seen at once when we come to define the limits of the upper Yangtse valley. For this term has varied in its application, as at different periods the limits of steam navigation have been extended up the Yangtse. At one time the river above Hankau, which place is only 600 miles from its mouth, was called the upper Yangtse; but nature in her topographical features, and man in his commercial developments, have combined to fix the line of demarcation at Ichang, a river port nearly 1000 miles from the ocean. And we may define the valley of the upper Yangtse as the area drained by the Yangtse river from its sources in Eastern Tibet to the point near Ichang, where it emerges from the difficult mountain country through which it has cut its far-famed gorges, and by which its still more notorious rapids have been formed. At Ichang through commercial communications with the ocean by steamer ceases.

Having now defined the limits of the upper Yangtse valley, it is necessary to consider that important part of it comprised in the province of Sechuan. Sechuan naturally falls into two divisions, which differ in almost every respect, and to such an extent that they must be studied separately. These two divisions are—

1. The western highlands; the greater part of these may be called Tibetan Sechuan. It is a wild inhospitable region of high mountain ranges which have been thrown off as offshoots from the Central Asian plateau, forming a country through which enormous rivers, useless even for junk navigation, cut their impetuous course, and which suffers from a rigorous climate and bad internal communications, and has a scanty population, largely Tibetan, speaking that language. Except in the districts on the edge of the Red basin and in the valley of the Chien-Chiang, it has the most limited agricultural resources, but it possesses great wealth in unworked deposits of the precious metals.

2. The eastern division, which may be termed the Red basin on account of the geological formation of red sandstone of which it almost wholly consists. This division has an area of nearly 70,000 square miles and a population approaching to fifty millions. It was originally a plateau, but the soft red sandstone which formed it has been gradually disintegrated by the forces of nature, and the plateau has been worn away into a rich fertile country of innumerable tiny valleys threading their way through small hills whose sides are

terraced with fields to their very summit. The whole country is under the closest cultivation, parts of it supporting the densest population to the square mile that is to be found in any agricultural area in the world, its soil allowing in many places of three crops in the year being taken off the same land, the latter only requiring to be enriched by the fertilizing agents which its dense population have at their disposal, and of which they thoroughly realize the value. A country with immense industries, holding great deposits of coal, salt, petroleum, and

THE YANGTSE GORGE, NIN KAN SUMMITS 2000 FEET ABOVE THE RIVER.

in the older formation of mountains fringing it are to be found copper, lead, quicksilver, and gold. It has a network of rivers, all navigable for trading junks to the utmost limits of the Red basin, and which for certain stretches could be navigated by a class of suitably constructed steamers.

In the same way in which we found geographical features and commercial developments combined to fix the boundary between the upper and lower Yangtse at Ichang, so we find that they again combine

to fix the boundary between the two divisions of Sechuan, at Sui-Fu. At this place, where the barriers of the western highlands touch on the confines of the Red basin, navigation by native boats and junks entirely ceases.

It is this latter or eastern division which, with all the prospects it holds out for our trade, must interest us most. In considering its position and the lines of approach to it, it is necessary to realize that, except for the Great Plain, China is a very mountainous country. The fact of this basin of Sechuan lying nearly in the centre of China's mountainous regions, and having a succession of belts of steep ranges on every side of it, constitutes the great difficulty in opening up this wealthy province to our trade.

Nature herself, when she placed in the midst of these mountain barriers the original plateau from which this rich Red basin was formed, saw that it would be necessary to provide some means of approach to it, and to effect this she turned to her natural agency of a waterway. After allowing two of the rivers which arise in the Central Asian plateau to cut their way down to the ocean in a direct line from north to south, with such a velocity in their straight unchequered course as to render them not only useless for navigation to man, but, by the deep gorges through which they and their tributaries cut their beds, to make barriers which, as we shall see in Yunnan, render the approaches to the Sechuan basin from India still more difficult, she determined to make a third river, the Yangtse, the agent by which to open up this otherwise inaccessible province. Accordingly, she altered the direction of this river, which she had at first allowed to run due south close to the Mekong and the Salween, and parallel to the strike of the great western barriers of Sechuan, and made it describe an enormous curve, cutting these barriers until it reached the westerly limits of the Red basin, where it was able to take advantage of the softer formations and to develop into a navigable stream, suitable in this stretch even for steam navigation. But on reaching the eastern limits of this basin, the Yangtse has again to cut through mountain ranges running at right angles to its course.

Through these barriers it cut its bed, forming the celebrated Yangtse gorges. As it removed the softer formations of rock more quickly than the harder, these latter were left projecting as reefs, which, with banks of boulders deposited by the side streams, form the Yangtse rapids, on which nature is yet at work, but which still form a great obstacle to the free approach to Sechuan by means of this otherwise magnificent waterway.

Nature, as we see, works very slowly, and these obstructions still remain, and can only be overcome by man's ingenuity; and we will now consider what man has so far been able to accomplish, and what remains for him to do, before an extended use can be made of this river. Up to Ichang, as we have seen, there is direct communication with the ocean.

Vessels of 1000 tons burden ascend to this port, distant nearly 1000 miles from Shanghai. But at Ichang all merchandise has to be transhipped into junks of from 25 to 40 tons burden, which are tracked laboriously through the gorges by coolies, often as many as a hundred trackers being necessary for one junk, and nearly three months being taken in unfavourable states of the river: 10 per cent. of the junks are said to be wrecked on the voyage up.

Steam navigation from Ichang through the gorges has been tried,

SECHUAN SCENERY.

and, due to the enterprise of Mr. Archibald Little, who for years has been devoting his energies to developing our trade in Western China, one trading steamer, the *Pioneer*, was placed on this stretch of the Yangtse, and, under the skilful navigation of Captain Plant, made her first successful voyage up the rapids; but though there is no doubt that steamers can ascend at a favourable time of the year, yet it remains to be proved that the venture can be made a profitable commercial undertaking.

Some of the chief difficulties in the way of this through steamer traffic from a commercial point are—

1. The limited period of time during which steamers can navigate. The rapids are considered unsafe at dead low water, and are impassable during the months the Yangtse is in heavy flood.

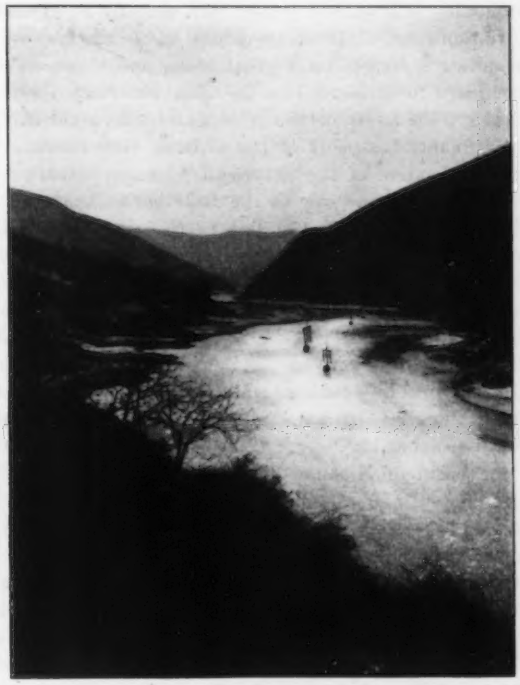
2. The limited size of the vessel that can be used if it is to thread the intricate channels of the rapids, and in such small vessels a large space has to be given up to engines and machinery necessary to give the power required. Thus the cargo capacity is reduced to a minimum.

3. The risks that must be run, however well built and well navigated the class of steamer may be.

I have already mentioned that 10 per cent. of the junks are said to be lost going up, and there is no reason to suppose that ships navigated by steam are likely to be more secure against similar risks. In this connection I may mention that it is not only the rapids which prevent successful navigation on this part of the river, but it is also the fact that at certain levels of high and low river, the water at the foot of the large rapids and of the gorges is contorted into swirls and eddies, which make accurate steering quite impossible, and it was probably due to this that the German steamer, the *Sui-shang*, when she made an attempt to ascend in 1901, was wrecked in the gorge just above Ichang. She carried a large number of passengers, including nearly all the missionaries who had been recalled from Sechuan during the "Boxer" troubles, and who took the opportunity offered to them by this steamer of returning with their effects. These latter were all lost with the vessel, though their owners' lives were saved, and as no supplies could be got in Ichang, many people were left almost without clothing. I was told that the British residents in Hankau very generously bought up the entire stock of clothing to be obtained in the shops in the British settlement, and sent it up for the shipwrecked passengers. My informant added that, though German enterprise had failed on this occasion to secure the carrying trade of the upper Yangtse, it had evidently been more successful in securing the trade of Hankau, for it was noticed that nearly the whole stock of articles so thoughtfully sent up from the British settlement were of German manufacture.

Gunboats have navigated this stretch of the gorges successfully, but the prospects of commercial navigation must not be judged by this fact. For they can afford to await between rapids and take each one at a favourable time; Lieut. Somerville, R.N., in a valuable report, has pointed out that when the water-mark registers over a certain level, the Hu-tan, a rapid close to Wan Hsien, a river town at the eastern entrance of the Red basin, becomes a dangerous rapid, and on a further rise it becomes impassable. During this time the Hsing lung tan, 30 miles lower down, does not exist as a rapid. Whereas at low water in winter, the Hsing lung tan becomes a dangerous rapid, and as the

water falls, its passage becomes quite impracticable. Thus you have two rapids, only a few miles apart, affected in directly opposite ways by the same conditions of river-level, and you may understand from this how difficult it will be to keep up any regular trade by steamers. When we were at Chong-king we found that three British gunboats, H.M.S. *Woodcock*, *Woodlark*, and *Kinsha*, and one French, the *Olry*, which had successfully navigated the rapids, were stationed along the more open stretch between the Wan Hsien rapid and Siu Fu. The



TYPICAL RIVER SCENE IN THE RED BASIN OF SECHUAN.

French had secured the services of Captain Plant, who, as I have mentioned, navigated on her first voyage the *Pioneer*, which has now become H.M.S. *Kinsha*. The latter is a larger boat than the others, which are small river gunboats of about $2\frac{1}{2}$-feet draught and from 11 to 13 knots steaming power. The *Kinsha* is 180 feet in length, of about 350 tons burden, drawing 6 feet, and with a speed of about 14 knots.

This stretch between Ichang and Wan Hsien is undoubtedly

susceptible of improvement, and various suggestions have been made to effect this by a system of locks, or even by the removal of the boulder banks of some of the worst rapids, or by the establishment of capstans on the banks, or of an endless chain on the bed of the river. Under the late agreement entered on with China, shipping firms will be permitted to carry out any reasonable works they may care to undertake to enable them to navigate this stretch, and no doubt the systematic use of some of the aids I have mentioned will be of great assistance during the limited portion of the year available for steam navigation; but it is doubtful whether this limited period will thereby be extended much, as to remove the worst obstructions which cause the low-water rapids would necessitate measures on a great scale, and these are too costly for any company to undertake on an open waterway for the benefit of the world's trade at large. Such an enterprise could only be taken up with the financial support of the Chinese Government, and then must be to some extent of the nature of an experiment, as one of not the least difficulties in the way is the fact that in the gorges there is in flood-time often a rise of 150 feet in the river-level. Once past Wan Hsien and its rapid called the Hu-tan, there are no more bad rapids, and suitable steamers placed on this stretch could navigate it throughout the year, as from the Hu-tan rapid near Wan Hsien to Sui Fu, the easterly and westerly limits of the Red basin, only a few reef rapids, with no bad currents or dangerous swirls, are met with; and British shipowners would do well to turn their attention at once to this part of the river, with the numerous large and prosperous cities situated on its banks, to which trade is brought from the farthest points of the basin of Sechuan down the many Sechuan affluents of the Yangtse, for on this stretch there is an enormous local carrying trade that could be secured by properly constructed steamers. Wan Hsien has been opened this year as a new treaty port.

It is evident, however, that if we are to find means of bringing our manufactures direct from an ocean port into this rich province, and if we are to develop its resources so as to enable it to take an increased amount of our trade, we must seek a line of communication which will give greater security and a more regular and easy means of transit than is afforded by this waterway.

Having given you a brief outline of some of the main features of this upper Yangtse region, I now propose to take you briefly over the course of the two journeys which I made to reach it from 1900 to 1902.

In the early part of February, 1900, I left Bhamo, our frontier garrison town in Burma, accompanied by a Hindu surveyor, a Mohammedan cook, and a Chinese interpreter; the latter, though he had never been out of Burma, had been born of Chinese parents in the large colony in Mandalay, and spoke Chinese fluently. I also had six Gurkhas with me; these latter had been brought so as to lessen the

risk of attack when later on we should be travelling through a region of No-man's-land, infested by wild head-hunting tribes, whose territory we might have to traverse on our return journey to India. At the time we had no idea in what a volcanic state China itself would be in the summer of 1900, yet I learned to realize the value of the Gurkha escort at a very early stage, for on reaching Momein, more commonly known to the Chinese as Teng-yueh, I found the populace in a most violent and dangerous state of excitement. My Chinese interpreter was so terrified by the threatening condition of things that he bolted as soon as we had entered the town, and I never saw him again.

It was only due to the fact of our being a strong party that we were able to withdraw in safety, and for some days we were more or less in a state of confinement. I only later learned the real reason of this hostile attitude, when, after crossing the Salween and arriving at Yung-chang Fu, where there is a telegraph office, I received a telegram from the Deputy-Commissioner of Bhamo, recommending me to abandon my journey, as a Chinese regiment had attacked a column of Burmese military police inside the limits of the Indian frontier, and seventy of the Chinese had been killed and wounded. As these men belonged to a local levy whose headquarters were Momein, I had naturally come in for rather a warm reception at that place, the news of the encounter and losses having arrived there the day before I did. Everything had been peaceful when I left Bhamo, so I had looked upon the rumours I heard before entering Momein as being terribly exaggerated stories of some unimportant incident. I am not surprised at my interpreter dreading a fearful fate; as a foreign-born Chinese, he would have met with short shrift at the hands of a patriotic mob. A year afterwards, at Peking, I met a British officer who had been on the frontier at the time of the occurrence, and he told me that immediately it took place a Chinese in the Burmah police employ had been sent across the frontier to follow up and warn me. This man never returned to his family, and all inquiry as to what had become of him was fruitless, and there was very little doubt that he had met the fate which my interpreter fled to avoid. I was also told that the latter had arrived safely at Bhamo, where he announced with great richness of detail that he had seen the whole of our party massacred.

A little north of Yung-Chang-Fu I proceeded over new ground hitherto unmapped, and, after crossing the Mekong, made my way up the Yang-hi river and across to Shi-Ku, where the Yangtse makes its great bend as shown in the surveys recently made by Major Davies and Captain Ryder. From here it had been my intention to follow Gill's route to Attentzu, but in attempting to cross the first pass I was so badly blocked by freshly fallen snow that I recognized even were I to get over this one, further progress would be hopeless, as a second and much worse pass still remained to be crossed. I accordingly doubled back,

crossed over the dividing range to the Mekong valley at Wei-si—even this I surmounted only with the greatest difficulty—and got the mules over by letting them go up unloaded, all of the party carrying the mule-loads on their own backs. From Wei-si I followed Prince Henry of Orleans' route up to Attentzu, at which place I arrived on April 6, and found Major Davies and Captain Ryder had arrived two days before. As we had agreed to meet between March 31 and April 13, and had each been travelling for some months from different quarters, meeting with a good deal of obstruction and difficulties, this was as good time as we could have expected to make. Their routes had converged at the Attentzu side of the second pass from the point at which I had turned into the Mekong valley, and they told me that I had been very fortunate in deciding not to continue in my attempt to proceed over the first pass, as so much heavy snow fell during the week that I would certainly have been held up between the first and second, unable to go on or go back. They themselves would have been unable to proceed from the further side of the second pass had not a large Tibetan caravan of over one hundred mules arrived on the same day, and by joining forces and sending out all their mules without loads on for two days, they succeeded in beating down a hard track in the soft snow, by which, on the third day, they were able to get over with their loaded mules. With the few mules I had, such a proceeding would have been useless.

Captain Ryder, in the interesting address which he gave in 1902 on his journeys, told you about our further progress and adventures from this point, so I will not dwell on details of the journey any further except to state that after three months more, spent mostly in the western highlands of Sechuan, or what I have called Tibetan Sechuan, we first came into contact with Western civilization and news of the outer world by meeting in the Tibetan town of Li-tang three French Fathers of the Tibetan Mission, who had recently come up from Chong-king. I remember that our first anxiety was to obtain news of the South African war, as the latest we had heard was of the engagement at Spion Kop, and in the end of June we first heard from these Fathers the good news that Ladysmith had been *debloqué*. We eventually found our way down to Sui-fu, near which place, I have already mentioned, is the boundary of the Red basin, and junk navigation begins, and from here we made our way down by native boat to Ichang, and thence by steamer to Shanghai. In the discussion which followed the lecture to which I have referred, Major Davies, who has earned the right to be regarded as the pioneer of detailed exploration and accurate survey in Yunnan, gave some very pertinent remarks about the proposed Burma—Yunnan—Yangtse railway. As it is impossible to obtain a thorough grasp of the problem of opening up communications with the upper Yangtse regions without referring briefly to this projected line, I will ask you to glance at the map, and to

remember that Yunnan is an elevated tableland formed by a continuation of the same mountain mass which I have already referred to as having been thrown off from the Central Asian plateau and occupying Western Sechuan. The same immense rivers which we have seen cleaving this mass in the highlands of the latter province, on their further progress to the Indian ocean, cleave their way through the Yunnan tableland, cutting their beds hundreds of feet below its summit level, and any line from Burma to the Yangtse must cross these limiting ranges at right angles to their strike. But, as Major Davies so aptly pointed out, travellers who have ridiculed the possibility of any railway communication, and whose dictum has so often been quoted, have usually

A PASS ON TA-PA SHAN RANGE OF NORTH SECHUAN.

appeared to be under the idea that a line of rail must cross these ranges somewhere in the neighbourhood of the direct coolie route which they have followed, and which, as is usual in China, takes a bee-line over hill and valley.

As a matter of fact, a practicable line for a railway has been surveyed, but one diverging by some hundred odd miles from the direct route of travellers. The expense of its construction would be great, and until Yunnan, which (except in its latent resources) is a poor province, has been developed from other directions, it would be inadvisable, from a commercial point of view, for a company to undertake such an expensive project; but, from what I have seen, I feel confident

that, as further developments occur elsewhere, and these upper Yangtse regions are opened up, and their industries and rich resources are developed, railway communication between them and Burma will necessarily follow. I must also draw your attention to the more direct line of communication with the Indian ocean *viâ* Ton-king by means of the French line from Yunnan-fu. There is no doubt that from their port of Hanoi to Yunnan-fu the French have a far easier line to construct than we should have from Burma, as it follows up the line of the valleys. But Yunnan-fu is only the halfway house to the rich regions of the upper Yangtse, and not much will be gained by carrying a railway only to that point. The French railway concession at present only extends as far as Yunnan-fu, and for its construction a guarantee has been given by the French Government; but the shareholders can never remain satisfied to stop here, and will undoubtedly seek for a further concession to carry them on over the 400 miles between Yunnan-fu and the Red basin. From Yunnan-fu neither British nor French projected lines would have any advantage over the other; the same class of country is open to either to follow, and a very difficult one it is.

The province of Yunnan, as I have said, is mountainous, and, due to various causes, is sparsely populated; its soil, however, is capable of supporting many more people, and immigration will undoubtedly pour into the province as it gets opened up and pressure of numbers causes the excess population of other provinces to seek an outlet. It is very rich in minerals, which have as yet been worked by inadequate and primitive means. The present population will never do much, as their energy is sapped by the use of opium. A long acquaintance with the use to which the people of India put this drug had led me to believe it did little harm, and to be sceptical of the stories I heard of it in China. In India, where it is chiefly swallowed in small pellets, and seldom smoked, taken in moderation as it is by the majority of those races given to its use, it is a valuable restorative, and does little harm except to those who become its votaries; and these are, I believe, infinitesimal in proportion to the numbers who make a reasonable use of its valuable properties. In Yunnan I saw practically the whole population given up to its abuse. The ravages it is making in men, women, and children are deplorable, and, though entirely out of sympathy with the violent views of some people, and the extreme measures they would resort to in India, I was quite able to realize that any one who has seen the wide abuse of opium in Yunnan would have an abhorrence of it that would lead them to take exaggerated views of the harm it did elsewhere. In Yunnan I felt that any measures would be justified that would save an intelligent and civilized population from being wholly demoralized in physique and energy, and from being ultimately extirpated by the fatal abuse of a valuable drug. The soil and climate of Yunnan are suited

to the cultivation of a good quality of opium, and little of the Indian product is imported into this province. Everywhere one sees fields of poppies, and even at the height of 7000 and 8000 feet, where irrigation is possible, patches are cleared and fertilized for the plant.

We arrived at Shanghai the day before General Sir Alfred Gaselee, who was on his way out in command of the contingent sent from India, and we were so fortunate as to be detailed to proceed to Tientsin, and later to march with the relief force to Peking. I then had the privilege of spending a year at Peking inside the forbidden city walls, in a part to which hitherto only the most privileged Chinese had been allowed access. It would be impossible to expect ever to repeat such a unique

CARRYING COTTON YARN INTO SECHUAN.

experience, and to see Peking again under conditions quite so wonderful. All that had been most treasured, and that had been reserved only for the view of the emperors themselves on the most solemn occasions, was open to inspection. We could wander where we wished in this wonderful city, from which, except for its fringes, every one had been so jealously excluded, and for weeks and months palaces and temples which had never been viewed even from outside by the foreigner could be freely entered.

It was with the deepest regret that we learned of the murder of the late Captain Watts Jones, R.E., whom at one time we had hoped we might meet in Sechuan. In his untimely death the state suffered a severe loss. He had made a most careful study of the problems connected with these

upper Yangtse regions, and had he been spared to give further work to their solution, his talents and genius were of such an order that success must have attended his efforts to impress his views, which he had already begun to formulate, on those who had the means to carry them out.

In September, 1901, the armies of occupation were withdrawn from Peking, and on the 20th of that month I found myself again starting on a journey of some thousands of miles towards the upper Yangtse regions, the plans for which I had been maturing during these months of enforced rest. I was so fortunate as to have for a companion Captain Hunter, of the Royal Engineers. He had, like myself, enjoyed an experience of the south-western approaches to the Yangtse regions, having in 1899 surveyed the country south of the Yangtse on behalf of the Yunnan Company.

We both looked forward with great interest to entering them from the north. There was, however, so much of geographical interest in Central China that, instead of taking the direct route to Sechuan at once, our idea was first to spend some months in exploring those regions of Central China of which up to date little has been accurately known, and of which there are no reliable maps. We were each accompanied by a surveyor, and, as the country was still in a disturbed state, we each had a small escort of three Gurkhas. The party was organized in all respects as two complete units for the purposes of work and travel, so that, as soon as we had sounded the temper of the people and found that we could with safety divide, we might be in a position to do so for three or four weeks at a time, and thus cover twice the amount of ground in the time at our disposal. As interpreter we took Mr. F. A. Harris, who had spent many years in China, and we also had a Chinese, a man called Tang, with a face like a ferret, and with a still sharper nature, and who, according to his own statement, had once rejoiced in belonging to the naval school, with the rank of lieutenant.

From Peking we travelled by the Peking-Hankau railway as far as Paoting-fu. This latter was the place on which a mixed force of the allies, under the supreme command of General Sir Alfred Gaselee, had marched soon after the relief of Peking. At that time there was no alternative to route marching, as the "Boxers" had pulled up the line, destroying all the bridges; but the French force, in their subsequent occupation of the region adjoining the railway, had supervised its reconstruction, and we now travelled over it very comfortably for nearly 100 miles to Paoting-fu, which place we intended to make our starting-place for our march across the Great Plain to our first objective of Kaifeng-fu, on the south bank of the Yellow river.

It was very interesting to have seen Paoting-fu before, under such different circumstances as those of its occupation by a foreign force, and some of the contrasts were very marked. The lieut.-general whom I

found commanding on my second visit is one of the heroes of Gordon's ever-victorious army, and the pride with which he spoke of it, and the veneration and affection he evinced for his great leader, filled one with a sense of pride of race in being able to lay claim to being a fellow-countryman of Gordon. Great Britain was so wholly connected in his eyes with this great hero that, on learning we were British, he asked whether we lived in London or Scotland, as if they were the only two places that composed Britain. Paoting-fu is very typical of all these cities of Northern China, amongst which it ranks only second in importance to Peking; it is the provincial capital of Chihli, which province, I need hardly say, holds the capital of the empire. These walls are not at all unlike those of Peking, but on a smaller scale. At one time it was quite possible that, as a retributive measure, these walls might be destroyed by the allies as were the walls of the native city of Tientsin, for during the early period of the "Boxer" troubles, some atrocious murders of European missionaries had been committed at Paoting-fu, and the expedition I have referred to was sent there to determine how far punishment should be inflicted on this city. On the approach of the force, the chief official of Paoting-fu, a mandarin only second in provincial rank to Li-Hung-Chang, who was then Viceroy of Chihli, came out to receive the general. This mandarin had been very anti-foreign, and had not exercised his authority to stop the barbarities committed on European men, women, and children in this city, probably at that time considering the murder of a few Europeans as a matter unworthy of his interference. He now assumed a very different attitude, and, to show his humility, came on foot to meet the general of the avenging forces, and in anything but a happy frame of mind; and he had every reason for this, as his present attitude was not allowed to mitigate his past evil deeds, and he was tried by an International Court, and was, for his complicity in these murders, sentenced to execution.

At Paoting-fu we started on our march across the Great Plain, though even at that time construction trains were running to Chengting-fu, 50 miles further on. Kai-feng-fu is on the south bank of the Yellow river, 396 miles from Peking, and might be said to be our objective for the first stage of our journey, but before reaching it we had to travel through all the northern part of the Great Plain, with its numerous walled cities, one of which we reached nearly every night. With the exception of one or two large ones, which are still of importance, such as Chengting-fu and Changte-fu, the same description applies to nearly all—cities only entitled to be called so from the enormous walls which enclosed them, relics of a former greatness. These walls were always built on the same plan as those of Peking and Paoting-fu, and were usually from 30 to 40 feet in height, and with a breadth of 16 to 30 feet, and with enormous gateways and bastions; often little more than one-eighth of the enormous area they enclosed

being built over, the rest being under agriculture. Such houses as there were showed the greatest signs of poverty and of a dwindling population. We often inquired the reason of this, and the reply given was, that since the rise of Tientsin as a foreign port of call for steamers, trade no longer came along the high-road to Peking, but went down direct to Tientsin. This alone was not sufficient to account for the decay; the latter must have been a process extending over one or two centuries.

Whether the great trunk railway which runs through this country, and which as we passed was under active construction, will remedy all this and bring back their lost prosperity to these desolate cities remains to be seen. It is, I think, almost certain to. For there is not only this main north-to-south French-Belgian line, which will connect Peking with the Yangtse valley at Hankau, and eventually with the ocean at Canton, but there are also great side extensions from this Pei-Han line, which will open up much of the surrounding undeveloped country. At Chengting-fu will be the junction of a German-controlled line, which will link up at Te-chau with the main German line in Shantung, and which will bring up goods to this region from the German port of Tsing-tau in the German possessions in Kiao-Chau bay, the main line from which has already been completed to within a few miles of Chinan-fu. Then the country to the north will be opened up by a Russian-controlled line, which for the present will extend as far as Tai-yuan-fu, the capital city of the province of Shansi, and at Kaifeng-fu; the heart of Central China will be tapped by another German-controlled line, and by it the trade of Central China will be brought into contact with the same German port. In fact, these two German lines, connecting as they will Central China by a more direct route with the ocean-borne trade of a great continental manufacturing nation, may exercise a more marked effect on these regions than even the French-Belgian line is likely to on its north-to-south course from Peking to the Yangtse valley. The gauge of all these lines is one of 4 feet $8\frac{1}{2}$ inches, which has been universally adopted on all railways so far constructed in China. The earthwork over a large extent of the 720 miles which the Peking-Hankau line covers has already been thrown up, and trains are running for nearly 200 miles from either terminus, but a great deal of extensive bridging has to be completed before through communication can be established.

We crossed the sandy beds of many rivers, and though the line may be carried over them at slightly more favourable points, the difference cannot be great. The breadth of the principal ones will give you some idea of the task. The Pu-ta-ho outside Chenting-fu has a bed of 450 yards; the Sha-ho has a bed of 1600 yards; the Chang-ho near Tzu-chu has a bed of nearly 3000 yards, which in flood is often covered, though when we crossed its channel was barely 60 yards in breadth. There are

numerous smaller tributaries, such as the An-yang-ho outside Changte-fu, and finally the Yellow river itself. South of Chengting-fu, the country we passed through had been suffering from several years of scanty rainfall, and as much of the soil is light and sandy, and, except in the region near Changte-fu and Tzu-chu, very little irrigation can be carried out on any large scale, the people had suffered much distress. These two last-mentioned cities are situated in a very fertile part, and are very prosperous. Changte-fu having over 100,000 inhabitants, it must not be confounded with Chengting-fu, a city of almost similar size. The cart road we travelled over is fair in parts, but in the rains must be impassable, for the road is sunk 5 or 6 feet below the level of

OLD BED OF YELLOW RIVER.

the surrounding country in many places, and even where level little attempt is made to keep it in order.

We passed a large number of Roman Catholic churches. Chenting-fu is the centre of the diocese, which the bishop here told us covered 1200 square miles, and embraced 35,000 converts. The order of Lazarists administer this part of the province of Chihli. Nearly every Roman Catholic order has a special province told off to it. This city also contains a celebrated Buddhist monastery, built in a former dynasty, and once of great grandeur, but now in the state of utmost decay. Through the ruined roof the head of the colossal figure of Buddha, which is 70 feet high, was projecting, exposed to the elements. The decay of these temples and monasteries nearly all over China is

very striking. Except in Mongolia and far Western China, little is done for the Buddhist religion now. In former days the temple had received large sums of money as presents from the throne, and emperors, when travelling, had slept in its monastery, but now the priests were in the greatest poverty, and it was with difficulty they were supported. The Chinese have little reverence for any of their temples, and only under pressure give a pittance for the support of their staff, though, as the buildings are often used by powerful guilds of merchants as a rendezvous in which to meet and hold banquets, they are sometimes elaborately kept up for this purpose. This ruined temple afforded a striking contrast to the majestic towers of the French cathedral which rose alongside of it, with its well-kept grounds and convent buildings.

All through the "Boxer" troubles the Lazarist Fathers had been able to remain here unmolested, and the mission and cathedral buildings remained untouched, although 130 miles away, in the capital of the empire, every mission was being burnt, and not a stone of them was allowed to remain on another, and the Pei-tang cathedral was sustaining one of the most remarkable sieges that have ever occurred during the world's history. That the Chenting-fu cathedral, in a large city so near to the seat of the "Boxer" disturbance, should have escaped untouched is a most wonderful example of the system of decentralization of authority in China, and the way in which a local official can, if he chooses to take the responsibility, adopt his own line of policy, and be certain of being able to control the people of his district.

There can be no country in the world where the local officials exercise such complete control, and nowhere is there such a law-abiding populace, nor one which, even when labouring under excitement, can be so easily swayed by a firm attitude on the part of the district ruler. The latter in this city discouraged any attack on the foreigners or their property, and though he only had a few ragged, ill-armed constables to enforce his authority, the fact that it was the line their official took was sufficient to influence the populace to adopt an attitude of neutrality to foreigners, and during the whole of the troubles the Fathers remained inside their walls unmolested.

To show that he is travelling with official sanction, it is always necessary for the traveller in China to have a small escort. They would very possibly be useless were he attacked, but the fact of their presence denoting official protection is quite sufficient to safeguard against this. As the "Boxer" troubles had hardly yet subsided in some of the districts we passed through, we often had as many as five or six men told off under the charge of a very intelligent man, who enjoyed the Chinese rank of captain, but who would correspond to a sergeant with us in his functions. As it would redound to his credit to pass us through without any disturbance, I noticed he was very diplomatic in allaying any uneasiness on the part of the villagers as to our intentions. I noticed

that, always after we had been extracting any information about our routes and other points, they would often ask him, in a suspicious manner, what the foreigners wanted by asking such questions. He would thereupon take them aside and whisper to them very confidentially. The villager would usually look at him incredulously, but on his repeating the statement more emphatically and still more confidentially, the former would regard us quite benevolently, and go away apparently pleased. After this had occurred on several days, I asked him what he said that had such a magical effect. He replied, "I tell them that the foreigners are reporting on the population and supplies, so that they may later on come down and distribute famine relief in those districts that require it."

DESCENDING PASS OF TA-TA SHAN.

As the agent for the distribution of £10,000, collected by a New York paper for famine relief after the "Boxer" outbreak, had just been passed through by the authorities, this sounded a more probable tale than seemed likely at first.

We passed the Wei river, from which the Peking Syndicate are constructing a line of railway to their coal and iron concessions in Shansi. It is to be a little over 100 miles, 70 of which have already been constructed, all the material for which has been brought up 700 miles from the coast. On crossing the Yellow river we found ourselves at Kaifeng-fu, a former capital, and a most important city, as commanding much of the trade of this part of Central China, and as being the provincial capital. There is an immense amount of historic

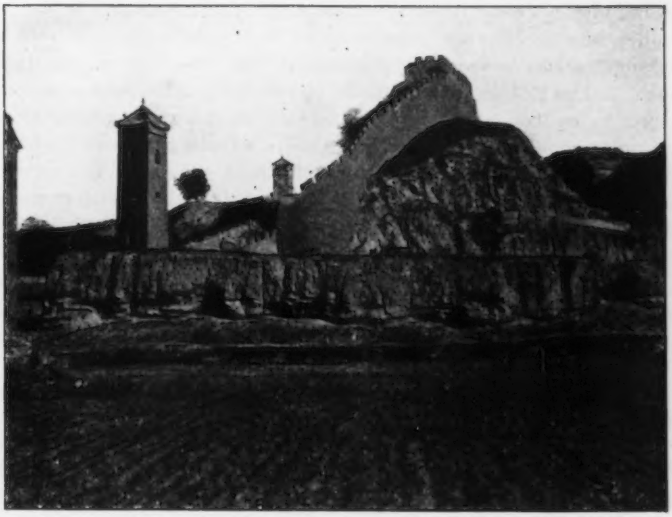
and commercial interest in this place, which I am unable to enter upon now.

From Kaifeng-fu we continued our march along the south bank of the Yellow river, with the object of entering the Lo river valley, a little above the junction of the two. In a few stages we had left the alluvial soil of the Great Plain of China, and entered on the country occupied by the loess formation. Loess is a light friable yellow soil, which covers a great part of Honan, Shensi, Shansi, and Kansu, and on it the agricultural prosperity of these provinces entirely depends, for, as Richthofen has pointed out, once out of the Great Plain, there is very little alluvial soil to be found, and were it not for the natural richness of this loess formation, only the scantiest cultivation could be carried on. We are indebted to the great German traveller and geologist for a reasonable theory of its origin in this part of the world. It is believed to be derived from a sub-aërial deposit of sand and dust blown by desert winds from Mongolia and the Central Asian desert regions, and deposited through countless ages on the vegetation of those regions lying to the north of the Chin-ling range of Central China. Successive generations of plants have through these thousands of years been decaying, and their elements have united with the dust to form fertile soil, giving rise to more vegetable life, which in its turn has been buried under more wind-borne sand, and perished to form fresh loess soil, until there are places where this formation has a depth amounting to nearly 1000 feet. The loess exercises two marked effects on the economic conditions and surroundings of the people of Northern China: (1) It can be ploughed with very little labour, and it requires no fertilizing agents. Nothing is done to replenish it beyond, at rare intervals, strewing a little fresh soil, easily obtained from the adjacent cliffs and ravines. Hence, after wars or famines, the country has always been rapidly repopulated, bountiful crops being procurable with little labour. (2) The peculiar vertical cleavage of loess causes the most insuperable difficulties to free communications in a loess country.

Looking across it in the distance when the traveller rises to the surface above the deep ravines in which the road is sunk, it presents a smooth, easy stretch of plateau land, which seems most easy to travel over, and gives rise to a feeling of regret on the part of the traveller that he should have kept for so long on the road, which is usually sunk 30 to 50 feet between perpendicular walls; but on trying to strike a line across country, he is very soon undeceived, and obliged to have recourse again to the sunken track, which is the only possible road. For after getting along very well for perhaps half a mile, he then comes on an enormous crevice across his line of route, perhaps only 20 or 30 yards wide, but ramifying in every direction, which has to be followed along for miles before a crossing can be effected, and in another quarter of a mile the experience is again repeated. It would be a most difficult

country to make a railway or to move troops in off the narrow sunken tracks, and this latter fact must have been strongly impressed on the local Chinese officials, who were bound by custom, as far as was humanly possible, to lay down a new road for the return journey of the emperor and court from Hsian-fu, where, during the occupation of Peking, they established themselves.

Everywhere this had hitherto been carried out successfully, and all along our route we had seen the earthwork of a fine, broad track of 20 yards in width raised 2 feet above the level of the surrounding country, which was being thrown up by the villagers through whose fields it passed. These had to supply the labour free; organized bands



LOESS COUNTRY.

of trained labourers afterwards travelled along its whole length to finish it off. It usually lay close to the public road; and a very amusing thing to note was that all the old obsolete watch-towers, of which there are often five or six to the mile, and which probably for many past reigns had been broken down and out of repair, were carefully covered over with matting, so that their ruined state, though it was known to the court, should not force itself obtrusively on their notice, for by ancient edicts these towers must be kept in a proper state of repair and defence.

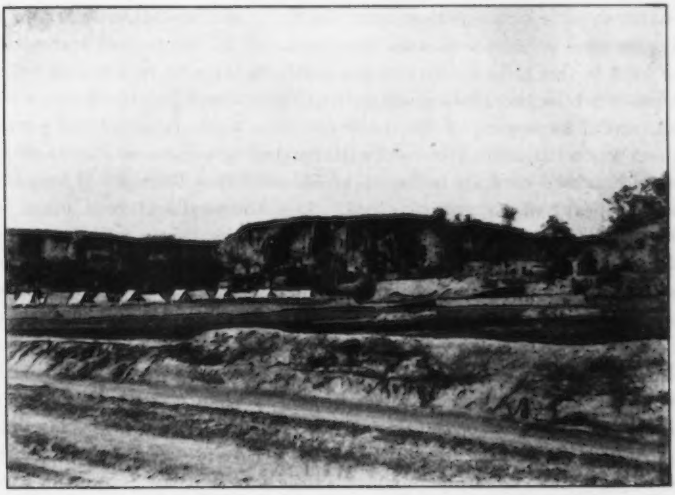
However, this broken loess country between Kaifeng-fu and Honan-fu completely defeated the loyal officials, and it was only here and there that they could venture on a new alignment; and it was quite

impossible to lay a new road alongside of the old, as the 8 or 10 feet of space between the vertical loess walls barely gave width enough for two carts even to pass on it. Our road lay some few miles from the Yellow river, and, except when it approached some of the towns which were situated in more open ground, it kept for some days in these narrow tortuous ravines, which gave one the impression of being shut up in a prison, as one could only see about a hundred yards of the narrow winding lane in front. We then crossed some cols, one of these rising to about 1000 feet, and we got a good view from it, which is difficult to describe, as this loess country is capable of presenting so many different aspects. A bird's-eye view from the summit gave one the impression of a plateau ending in cliffs which dropped sheer into the bed of the Yellow river, the channel of which stretched away for 2 miles, and the low flat mudbanks of the opposite shore formed a striking contrast to the sharp cleavage of the loess cliffs on the right bank. But on looking down into the plateau-land, there were enormous fissures to be seen, with deeply cut terraces running along their sides in rough, rugged lines of tremendous tiers, affording an aspect of the greatest strength and wildness, and sometimes a fissure yawned still further open, showing loess cliff standing out like a bluff with terraced sides sloping backward, and a steep drop where these had cleaved away below. The whole conveyed an idea of tremendous earthworks and the fossæ of gigantic hidden fortifications cut out in past ages by some race of giants, and the dull, grey, yellow-dusted look of the loess, with the villages hidden away in the ravines, added a fantastic, weird aspect to the whole scene.

The inhabitants of these villages largely live in houses cut into the loess, not from any poverty, but because they are easily excavated, and are warm in winter and cool in summer. We stayed on one occasion in a typical one; it was about 15 feet in breadth, and went in about 50 feet, and had deep recesses cut in its side walls for sleeping-bunks. After crossing these cols, we came on the Lo river a few miles from where it enters the Yellow river; its valley here is a mile wide. It was quite a relief to enter it after being imprisoned in the narrow ravines of the loess country. Our road followed along a very heavily irrigated plain, full of market gardens and densely populated. We crossed the river, which is here 180 yards in breadth, by a bridge of boats; a new bridge had been erected alongside of this for the court's passage.

In winter the Lo is frozen over; by laying down straw and millet stalks the ice is strengthened enough to form a bridge for carts. Even early in November we had a heavy snowfall. On approaching Honan-fu we made a *détour* to avoid the court, and again followed up the Lo valley, which now had narrowed to about a mile in breadth between hills rising 800 feet, terraced to the very top for cultivation. The river had in former years, owing to its wandering course, cut great bays into

the hillside, and, aided by the natural tendency to cleavage of the loess cliffs, and atmospheric influences aiding this still further, had given rise to many fantastic configurations which gave a fine scenic effect. The road continued to be good, and gave rise to the hope that we should discover it afforded a good route the whole way up, as, if so, it would form an important line of communication; but we were destined to be disappointed, for, after passing Yi-Yang-hsien and Yun-ning-hsien, two fairly large and prosperous towns, the hills became steeper and more rugged and the valley contracted, until about 40 miles from Honan-fu the river became a mere stream, whose channel filled up the gorge from which it issued. Up to this point the valley



LOESS COUNTRY.

had been very fertile, full of rice and wheat. Indigo vats were very frequently met with, but the manufacture was carried on in a most wasteful, primitive way. As everywhere else in China, German aniline dyes abounded, and were driving the natural dyes out of the market. Even in this out-of-the-way valley there was quite an assortment of foreign goods to be found, chiefly Japanese and continental stamped cheap cotton cloths. These come up from Hankow *viâ* Nanyang, and, although there was a direct route to the latter place, all goods went first to Honan, which is the distributing centre for these parts. Iron ware of all sorts comes from Shansi. We were told that two hundred years ago the Lo river could be used for traffic, and goods were brought up here from Yellow river; but now only boats drawing 15 inches

could get up, and there was little except local traffic carried along it in firewood and coal, which is plentiful here and of fair quality. All the streams are silting up, and a little further on we found all their beds raised above the level of the surrounding country. We were able to judge of the rate at which this was being carried on by a bridge thrown over one stream. The arch must have been originally at least 8 feet in height; now the bed was raised to within a foot of the top of the arch by sand and boulders. An inscription on a tablet near by stated that the bridge had been erected as a work of merit seventy years before. An old priest at Yung-ning-hsien told us he had never known of foreigners visiting this valley; but later on we heard that two Italian fathers, in a bad year of famine, had been up to the point where we now branched off into the hills to the south. The gorge here became so narrow that no room was left for even a foot track, and we kept to this hilly country to the south, in the side valleys and lower slopes of which there was much cultivation. I was greatly struck with the careful harrowing of the loess soil; the fields in which the young wheat was a little more forward with its dark green velvet blades stood out in beautiful contrast to the dark reddish-yellow loess soil where the young wheat had not yet come out. The care that had been taken to plant willows and cypresses so as to attain the best results for scenic effect would, in any other country, only be taken in some well-tended demesne; but the Chinese husbandman has an eye for landscape gardening in his fields as good as that of any trained Kew gardener.

The people here were very simple and unsophisticated. A boy to whom I gave a piece of silver for some small service, looked at it with the greatest disappointment, but became perfectly delighted when a Chinese soldier who formed one of the escort gave him some familiar copper coins of about one-third only of its value in exchange for it. When we wished to buy persimmon and other fruit, the people used to refuse to take any money, though I must say that the former fruit is rather a drug in the market, for on crossing the divide into the Shangchou district of the Han river valley, we found that three thousand persimmons could be purchased for the equivalent of two shillings in Chinese money. Some of the women had very fair faces, and I saw some with rather a Jewish type of feature.

We occasionally dropped into the Lo river-valley where its bed widened out; rice-cultivation was very extensive in the upper part of this valley. After reaching Lonan-hsien, we found ourselves surrounded by steep rugged mountains rising to about 4000 feet. Near here Captain Hunter struck up north to the head of the Yellow river and the upper affluents of the Han river, and I continued my course up there and on to Hsian-fu, where Captain Hunter and I again met for a few hours. His journey to the Yellow river had been full of interest. A most wonderful sight was the bend of the Yellow river itself as it

came down from the north and was brought to an absolutely abrupt stop by the Ching-ling range, which stretches as a barrier across, barring its further southern course. Striking against this range, the river at once turns off to the east, cutting its way through the soft loess formation which covers the country here, and by which its banks are formed. The fortress of Tungkuan, which is the key to Central China from all countries to the west-north-west, guards the only available route to north-western provinces of China and Tibet, and beyond these to the Central Asian regions and Russian territory, and it is by this route, as Richthofen has pointed out, that from the most ancient times communication between the Chinese Empire and the Western world has been carried on, and by which the supremacy of China was extended to the borders of India, Persia, and Bokhara, and it is along this route that some day further railway communications from Central Asia may be effected.

Hsian-fu is an enormous city, with walls of 16 miles in circumference. It is a great centre of distribution. It was the capital of ancient dynasties at various times between 2200 B.C. to 1100 A.D., and it has so much of interest in it that I could take up the whole of the time I have to it alone, but it is impossible for me to do more than to allude to its interest. The world-renowned Nestorian tablet, engraved in Chinese and Syrian characters, recording the introduction of Christianity into China by the Nestorians in A.D. 636, is to be found here, and is one of the most modern of the many interesting memories of this ancient city.

From Hsian-fu, by two separate routes, hitherto untraversed by Europeans, we crossed the Chin-ling range and dropped into the valley of the Han river. My route, one hitherto untraversed by Europeans, lay a little to the east of the one taken by Père David in 1868. Once inside the mountains, we very soon left the loess soil behind us, and began to cross very barren hills with narrow deep-sunk valleys, and little or no cultivation and hardly any hamlets to be found. In seven days we crossed four belts, the heights of which were from 8000 to 10,000 feet. There was a slight amount of snow lying about, and our great difficulty was caused by the surface of this melting in the hot sun in the day and freezing at night, when it became like glass, and our mules and horses were able to get along only with the greatest difficulty. Some of these hills were well covered with forests above, but below have been denuded, largely by fires.

We now dropped into the Han river at Yang-hsien, and at once began to realize we were in direct touch with the richer tc[illegible]s of the Yangtse basin, and those more in contact with Western civilization than any we had so far seen. The change in climate, too, was marked. The air had lost all its dry crisp cold; it was damp and chilly—in the mornings dense fogs. We proceeded up the valley of the Han, which is here wide and full of cultivation as far as Han-chung Fu, and used to be a

great grain-exporting country; now only just sufficient grain to feed the population is grown, and its place as an export has been entirely taken by opium.

From Han-chung Fu we crossed the Ta-ha-shan range by two different mountainous routes which were quite unsuited for loaded coolies even, and we lost many of our mules from falls over the precipices; on one day alone six mules went over, three being killed. The ascent from the Han river side of the watershed is very steep, and the only path that can in any way be termed such is the main one from Han-chung Fu to Kuan Yuang-hsien. From here we proceeded to Chong-king, meeting on the way Lieut.-Commander Somerville of H.M.S. *Woodcock*, who had come up the Chia-ling in a native boat, and to whom we were indebted for much kindness and for maps of the river routes; his skill in survey work rendered these of the greatest geographical value, and, with the 3000 miles of land routes which we surveyed in this province, will, I hope, make a reliable contribution to our geographical knowledge of it. At Chong-king we halted for a week before making a fresh start, and enjoyed the hospitality of Mr. Wilton at the British Consulate, and of Lieut. Goldie and Surgeon Baise on H.M.S. *Woodcock*, which was lying off Chong-king, and I need not say we thoroughly appreciated it after having been five months on the continual move through unsavoury Chinese inns. The French gunboat, the *Olry*, was on the point of leaving to go higher up the river. In command of her was Lieut. Hourst, who had been a companion of Major Marchand on his adventurous journey across Africa.

I was greatly struck by the way our Gurkhas regarded the British gunboat when they first saw it lying below Chong-king, and spotted the white ensign. They pointed it out triumphantly and said, in the tone of the greatest satisfaction and pride, "Hamara" ("Ours"). Now, had these men, before the occupation of Northern China by the allied armies of the world, met with this gunboat, they would have simply said, without any particular interest, "Sirkar ki jehaz" ("A Government ship"), but the possessive pronoun they now made use of signified that it had been brought home to them how completely they formed part of the British Empire, and were represented by this British gunboat 1600 miles in the interior of a foreign country. There is no doubt that the long occupation during which they were brought into contact with the troops of every great nation in the world, and under all sorts of circumstances, made our Indian troops appreciate being able to claim the citizenship of no mean empire, and to look on the British flag as being a great deal more than the emblem of an indefinite "Sirkar," and I felt that the use of this possessive pronoun established a far stronger link between us than even the months of faithful service they had rendered during my journey.

Chong-king is the commercial capital and chief port of the province;

it has a magnificent situation on a bold spit of land at the junction of the Chia-ling affluent of the Yangtse. This Chia-ling river is formed by the junction of three streams whose branches radiate over the whole of the central and eastern portions of the Red basin, and admit of junk traffic being carried on to the furthermost points of the latter.

Other great centres of distribution situated at the junction of navigable affluents are Lu-chau and Sui-Fu. The Min or Sui-Fu river is of such importance that the Chinese regard it as the main stream of the Yangtse. Junks navigate it up to the Cheng-tu plain, and bring down the trade of the dense population, which throughout this plain of about 70 miles by 40 averages about 1700 to the square mile, and this is taking a much lower computation of the inhabitants it supports than is given by the Chinese census. The whole of the trade of Sechuan at present passes, *viâ* these affluents, to and from the great waterway of the Yangtse. Exports are silk, white wax, medicines, nut-gall, pigs' bristles, rhubarb, hemp, fungus, hides, tobacco, lead, zinc, tea; and from Tibetan or Western Sechuan, gold, copper, furs, skins, rhubarb, and musk, and what at present is the most important from a foreign point of view, wool, the trade in which is steadily on the increase. Of agricultural products there are opium, wheat, barley, peas, beans, rape, millet, hemp, buckwheat, sesamum, potatoes, ground-nuts, Indian corn, rice. Foreign commerce is at present represented only by one resident British merchant and two French, several Japanese merchants, and there are two Chinese agencies of British firms.

It has been pointed out that the province contains all the elements for a great manufacturing development. These are—

(1) Great mineral wealth. Besides coal and iron, which are fairly generally distributed, gold, copper, petroleum, and salt are also found and extracted by the natives. (2) Silk, wool, and hemp offer opportunities for the development of the textile industries. The trade in these is already of considerable dimensions and capable of great extension. (3) Various other industries, such as the manufacture of paper, production of oil, sugar, etc., all capable of great development. (4) Lastly, an abundance of cheap, skilled, and industrious labour.

Raw cotton, cotton yarn, and cotton goods to an enormous amount form the chief foreign imports. All come *viâ* the rapids. Bombay yarn has firmly established itself all over the country, but Japanese yarn is steadily on the increase. Woollen goods, buttons, needles, thread, candles, clocks, lamps, brasswork of all sorts. The import of these and numerous other British manufactured articles will be enormously increased, if better and cheaper means of communication are established, and the latent resources of the province are developed.

The inhabitants of Sechuan, like most other Chinese, and unlike

most other Eastern, nations, require no education to make them appreciate articles of foreign manufacture. It is only necessary to develop the natural resources of the province, and to give its population facilities for securing a market, to ensure that the money is forthcoming. The Sechuanese will then buy everything that he sees will wear better than the home-made article, or which he is unable to make himself, or which will be of advantage in saving labour.

After four months in Sechuan, during which time, as I have already said, we extended our geographical knowledge of this part of China by nearly 3000 miles of accurate mapping, we turned back towards Shanghai. I took a route on the north bank of the Yangtse, Captain Hunter to the south. This latter route had never been travelled over by Europeans, and as forming a chord line across the curve the Yangtse takes between Hankau and Chong-king, it may prove to be a valuable line of communication to turn our attention to, and I regret very much that Captain Hunter is not here himself to-night to give you details of it. His absence on active service in Somaliland prevents this. We met again at Hankau, when what made me most realize that I had come to the end of my journey and was once more in civilization was being initiated, on a Japanese steamer officered entirely by Japanese, into the gentle art of playing "ping-pong."

I have tried in a short space of time to give you a sketch of our journeys, and I am only sorry that some of it had to be taken up by narrative which might have been devoted to acquainting you more fully with the interior of Sechuan, and the industries and products of its fifty millions, to secure whose trade is of such importance to us. These rich Yangtse regions are those above all others in China which afford the greatest opportunity for the development of our commerce, and it is only by studying further these problems to which I have briefly alluded to-night that we shall be able to open up this extensive field to British trade; and as well-wishers of all that concerns one's country's prosperity and furthers her commerce, this should be the aim which all of us, when studying the geography of these regions, should keep in view.

Before the reading of the paper, the PRESIDENT said: Colonel Manifold has been so good as to prepare for us a paper on a very interesting subject—the upper region of the Yangtse and Sechuan. It is only a year ago since we had another extremely interesting paper from two officers—Captain Ryder and Major Davies—who made a survey of this province, and on that occasion we heard a good deal of what Colonel Manifold had done, and now we are very glad to be able to welcome him and hear him in person. I will now ask Colonel Manifold to read his paper.

General Sir O'MORE CREAGH: The only observation I can think of making without entering on one of those long problems which Colonel Manifold has drawn your attention to is that, in considering the railway system of China, it is well to recollect that where you see Belgian land it generally means either French or

Russian, and, my experience is, mostly Russian, because I think it is financed by the Russo-Chinese Bank, which is one of those institutions which can only be developed in a country like Russia, where the Government know what they want and intend to have it by any means. I think it would be a very good thing if we could have similar banks. My duties in China were of a military character, and so I am not able to say much about commercial affairs, but I think that we all saw very well that commercial affairs were founded on political affairs, and that all political influence in China is concentrated round the railways, and wherever a nation has a railway, there it has influence. With reference to Colonel Manifold's remarks about the Gurkhas, in these days when rifle-shooting is of such importance to us all, I may remark that the Russians got up an international rifle match, and challenged all the other troops in China, and we had a match extending over four days, and the troops which I had the honour to command—the Indian—defeated them all, hands down. They never asked us again to have a rifle match.

Lieut. SOMERVILLE: I don't think I have much to say after the lecture which Colonel Manifold has just read to you about the Yangtse. I have been up there for the last two years in command of the gunboats, and perhaps I can tell you one or two things about the navigation of the rivers. If you will look at your maps, you will see that between Ichang and Hankau there is a stretch of very bad water indeed. When the river is high, which is during the summer, the gorges are quite impassable. To give you an illustration of what it is, when I went to join the ship she was at Chung Ching; I left Ichang in a small Chinese boat. I loaded my boat with stores, and had all my clothes, but I had not got more than about 10 miles when the boat was capsized. I sent nearly all my stores back to Ichang, and started again. I went on for about twenty-six days, and at the end of that time I had got 61 miles. I then sent the boats back, and took to my own feet, and got up quicker that way. It is rather a job travelling across China in the summer on foot. However, I got to Chung Ching after about six weeks' travel. In the gorges in the summer you have a very high river. It goes up to 120 or 130 feet, and they are about 200 yards wide. Some Chinaman about two hundred years ago thought he would do a good action, and he cut a causeway through the rocks so that you could walk through. It is rather warm there in the summer. You look in the river, and there are whirlpools going across from one side to the other, and they talk of taking steamers up there! In the winter the gorges are all right, and you can steam through them splendidly, but there are two rapids then, called the New rapid and the New Dragon rapid, which are impassable. The New rapid was formed in 1896. The land slipped in after the heavy rains and filled up the bed of the river. No one up above knew anything about it, and all the junks were coming down, and five hundred were wrecked in a whirlpool at the foot of the rapid. The story is that it was the work of the dragon. A friend of mine—Mr. Ferdinand Tyler—was sent up there by the Chinese Government, and he tried to exorcise the dragon. This landslip, so it was said, had been formed by the dragon turning over in his sleep. Mr. Tyler got there—there is a telegraph-office—and he telegraphed to ask permission to begin. They telegraphed to tell him that first of all the ancient methods must be tried, to see if the dragon could not be moved, and then, if he would not move, Western methods might be attempted. Well, the dragon would not move, and Mr. Tyler started with dynamite and shifted a bit of the river. No navigation is ever going to pay there. Now we come along up to the stretch between the Hutan and Sui-Fu. Well, all that part is navigable, all through the summer certainly. You want plenty of steam; but it is all navigable, and there is a very good trade indeed.

In the winter it is navigable too, but when you get a very low river, parts are very shallow, and there is a very bad drop in one or two places. You can get up the river Min in the summer, but not in the winter. There is no doubt that between Sui-Fu and Chung Ching there is a very good opening for steamers to run, and a paying one, and I hope we shall see British steamers running there before we see anybody else's.

Mr. G. J. Morrison: I am sure we have all to thank Colonel Manifold for his extremely interesting lecture on a country which has lately taken a very prominent place in international affairs. I think it is about twenty-three years since I read a paper here, or, at least, a paper of mine was read in my absence by the late Captain Gill on Journeys in China. Now, at that time very little was known by the public about that country. But since then so much has been said and written, that I don't think I can add very much to what we may call the descriptive geography of China. But I should like very much to say a few words on what I think I may call the commercial geography of China. The very poor state of the means of communication in China, and the necessity of improving them by the construction of railways, have been mentioned by Colonel Manifold. Now, the necessity of doing that was recognized a long time ago. It is more than a quarter of a century since I went out to China to construct the first railway. I laid the first rails; I superintended the running of the first train, and the issue of the first ticket—only to see my work pulled up within a year. Well, since then, naturally, I have taken considerable interest in Chinese railways, and have tried to keep up my connection with them. Now, in the intervening time, of course, a considerable number of railways have been made, and, although the entire length is not very great compared with the size of the country, it is still very considerable taken by itself. But one often hears complaints, or, at the very least, expressions of regret, that so short a length of those railways is in British hands. The Peking Syndicate, which is a British company, and which I see represented here to-night, has constructed some 75 miles of railway, and is going on with the construction; but that railway is in connection with their own mining scheme, and it does not yet form part of any through route, and has consequently attracted little attention. All the other British schemes as yet exist upon paper only, and that fact, coupled with the fact that preliminary concessions for these lines were granted years ago, is constantly brought forward by Englishmen and foreigners as proof of the want of enterprise on the part of the British concessionaires. Now, in the case of the Russian line, the German line, the so-called Belgian line, the various Governments have in each case taken a very active part, and in some cases they have taken upon themselves the entire construction of the line. The Americans, who work on a different plan, have just begun and carried out a very short length. Now, in England we have always looked upon private enterprise as very much superior to Government patronage, and if the Foreign Office do not take an active part in constructing railways or in guaranteeing them, however much we might wish to see them do it, still we must admit that they are only acting in accordance with the instincts of the nation. Now, although the Foreign Office have not actually taken up construction, they really have given some help. They have treated concessionaires much more favourably of late than they used to do in the olden times; and they seem to be anxious to do everything that they possibly can to advance their interests; and I think I may even say, I believe they think they have done everything that is possible. But I think that both the Foreign Office and the public have failed to see the great importance of one view of the subject, and that is, that if a railway is to be made by private enterprise, the money for making it has got to be raised from the investing public, who have to be shown,

not that the line is important and will increase British prestige in the East, but that it will pay. [The President here reminded the speaker that his remarks did not bear on geography.] Under these circumstances I shall not say any more, except that there have been difficulties in the way of the concessionaires; that in spite of that they really have begun work, and I hope before very long we shall see a very fair length of Chinese railways in British hands, and I hope that the British may be able to supply traffic, not only on their own lines, but on all the others.

Dr. Logan Jack: It may seem ungracious and ungrateful to commence by expressing a regret that Colonel Manifold's travels have been so extensive. If they had been perhaps a little less so, we might have hoped for more of those agreeable details of incidents of travel and personal reminiscences of which we had only a very small instalment, and that instalment referred chiefly to the eastern or Peking portion of the journey; whereas I, at least, would have been very much interested in hearing similar incidents of the western portion, because I think those reminiscences could not have failed to be of historical value even as showing the state of affairs in the western part of China during the time when the "Boxer" rising was going on in the east and north. It was my lot to be travelling about the same time as Colonel Manifold in Sechuan. I travelled on the whole from east to west while he was on his way from west to east, and our routes crossed or touched in various parts, although we never met. But, especially when we got on to the Mekong, we heard that Colonel Manifold had been before us a few months, and we, at least, benefited so far by his experience, that we were able to avoid some of the routes in which he found many of his chief difficulties. I am glad that Colonel Manifold has borne such emphatic testimony to the necessity for railway communication between India and Sechuan, and the advantage of such communication; and I am more than glad that he has distinctly and unequivocably stated that during his travels a practicable route has been surveyed for a railway. Now, I think that is of the utmost importance. Everybody who has travelled in China knows what the Chinese roads are. The Chinese are gifted hydraulic engineers, but when it comes to road-making their engineering is most painfully crude, as you may have gathered from descriptions and photographs which have been offered to us to-night. Any one travelling over one of the Chinese so-called main roads might easily suppose that he might despair of ever seeing the iron horse in that part of the world, but it is a mistake to assume, as one might logically assume in any other country, that the route followed by the Chinese road is the best possible. It is very much the reverse, as Colonel Manifold has abundantly proved, I think, to-night. Civilization is indebted to him and to his companions, who have shown that away from the known beaten tracks of Chinese roads, tracks which have been beaten by the Chinese for years, there exist practicable routes by which railways might be carried. There are two classes of people who decry railway enterprise in the west of China. There are those who, in the first instance, say it is impossible, and those who have been answered already to-night, and I need make no further reference to them. The country is difficult, but it is not more difficult than the Rocky mountains and many other places where railways have been carried, and the only question is that urged by the second party, who say that the population is so scanty and so poor that the construction of railways for their benefit is not worth while. Now, that is a decidedly important question, and yet I cannot believe that a population numbering scores, if not hundreds, of millions is not worth catering for. If each individual of those millions of inhabitants will take 5s. worth per annum of foreign goods, and the carriage on those goods may amount to as much, then I think there is at least a beginning for practical financial returns on the outlay.

There are many things of which the Chinese are large consumers—for instance, there is clothing. The youngest of us is old enough to remember the heroic efforts which have been made to capture the trade of certain African tribes which wear a minimum of clothing. Now, there are no human beings who wear more cotton goods to the square inch than the Chinese—fold after fold, worn, I regret to say, till they are worn out; but, at any rate, fold after fold of thick padded cotton is added as the winter goes on, and they are, I should think, among the very best consumers conceivable of cotton goods. Then, again, there is the item of milk. That seems rather a trifle to us who get all the milk we want, but to the Chinese it is a very different matter. Their country is almost wholly used wherever it is possible for gardening purposes, and they do not have cattle for the purpose of yielding milk. If you can conceive, as I have noted with wonder, millions of babies born and growing up every year, and not a single milch cow in all that teeming country, then you can understand that the import of preserved milk is a very important item in Chinese traffic; and I have seen Swiss and other preserved milk in tins in portions of China where its presence seemed an absolute miracle, considering the difficulties of transport. Such a traffic as that is of value. Then, again, there is wool, which the Chinese do not grow, but the Burmese and other tribes do, and all of these would bring their wool down the rivers if a railway were available to carry it into the more settled districts of China. It is true that Yunnan is not so thickly populated as Ichang, but it is obvious to any traveller that the ravages of the Mohammedan rebellion are being rapidly recovered, and the country is being re-populated by immigration from other more settled districts of China where the population is becoming too dense. If I have read history aright, it is in countries where there is a growing population that the demands of commerce are most urgent. Now, in such a country as that which is being re-populated there is not only the daily demands of the inhabitants for their wants, but there is all the demand which arises from the stocking of new homes, and that is very important, and from the establishment of the new industries which are rendered necessary by a growing population. I don't wish to enlarge upon this subject, because the time is getting very short, but there are many such instances that could be adduced of industries that would go to feed a railway from whatever direction it comes. And I do hope that the spirit which led our fathers to conquer other districts of trade will lead ourselves or our sons to compete for the trade of Western China. I will only now take the opportunity of congratulating Colonel Manifold and the Society on the very important and solid additions to our knowledge of the China of to-day he has made.

The PRESIDENT: We have indeed listened to a most interesting paper, very beautifully illustrated, and it remains for us to pass a vote of thanks to Colonel Manifold. I think the point of greatest interest in his paper is the description of the upper reaches of the Yangtse and of the richness of those districts which he has described. The density of the population shows that when these regions are opened and the steamers are running on the long upper reaches of the river, which have been described in more detail by Lieut. Sommerville, it will become a very important region. He has described to us the agricultural products of that region, among which he numbered the potato, and suggested that it might have been indigenous there. I think this is a mistake. It was introduced into Tibet by one of the greatest of our governors-general—not the greatest, because I consider that our Gold Medallist and late Vice-President is the greatest of the governors-general of India—but Warren Hastings was amongst the greatest of our governors-general, and it was through his forethought and care in considering the nature of

the country in Tibet and to the eastward that the potato was introduced about 120 years ago. And it has undoubtedly spread from the valley of Lhasa into Sechuan. Colonel Manifold has enumerated many other products, and he has enlightened us very much both as regards the density of the population there and the value of the mineral and agricultural products. I am sure we shall all wish to pass a very cordial vote of thanks to Colonel Manifold for his most interesting paper.

GEOGRAPHICAL DISTRIBUTION OF VEGETATION OF THE BASINS OF THE RIVERS EDEN, TEES, WEAR, AND TYNE.*

By FRANCIS J. LEWIS, F.L.S., Assistant Lecturer in Botany, University of Liverpool.

PART I.

The survey covers the source and part of the drainage areas of the rivers Eden, Tees, Wear, and South Tyne, and includes a large extent of high-lying moorland on the Pennines. The map was begun during the summer of 1900, and has been continued at intervals during the past three years.

On account of the size of the survey, I have divided the map into two parts—the southern, which is now given; and the northern, which I hope to publish later.

The present paper includes parts of the counties of Westmorland, Yorkshire, Cumberland, and Durham, and covers a portion of the drainage areas of the Eden and the watershed on the south-west side of the Tees. The objects of the present survey, briefly stated, are to trace out the boundaries of the chief plant associations, and to endeavour to correlate their distribution with the geological, topographical, and climatic features of the district. As the area of observation is extended, I hope that some light may be thrown on the distribution of vegetation in former periods. At the same time, such a survey will form a record by means of which future changes may be measured.

The chief factors governing the distribution of plant associations may be summarized thus:

1. The chemical composition of the soil water, such as proportion in which the various salts occur, and the state of combination in which they may exist.

2. Physical characters of the soil, such as texture, proportion of air and water retained, etc.

3. Climatic conditions, such as slope of land, aspect, drainage, altitude.

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* Map, p. 420.

4. Artificial agencies, influence of man and other animals.

The greater part of Yorkshire lying north of Huddersfield and Barnsley has already been surveyed by Messrs. Smith, Moss, and Rankin (1), and the first sheet was published in the April part of this *Journal* for 1903. I hope to extend the present survey north to the Cheviots, and then east and west to the coasts, covering the whole of the basins of the Eden, Tees, Wear, and Tyne. Such an area would include all the extensive moorlands of the northern region of the Pennines lying on the Carboniferous series with the Permian and Jurassic areas on the east coast, and the Silurian and Volcanic on the west.

A survey of this district might be expected to show many interesting differences between the distribution of the plant associations east and west of the Pennines to the coast, and would, in addition, together with the extensive area in Yorkshire already published, be large enough to justify drawing some general conclusions as to the relative importance of the different factors governing the distribution of plant associations.

Method of Survey.

The 6-inch maps of the Ordnance Survey have been used in the field throughout for mapping the boundaries of the different types of vegetation.

The country consists largely of unenclosed moorland without any strongly marked natural or artificial landmarks, and I found it impossible to use the 1-inch maps for the field work with any degree of accuracy, and for the same reason I decided to publish the two maps on the scale of 1 inch to one mile, instead of $\frac{1}{2}$ inch to one mile. By doing this I felt that certain points in the relation of distribution to altitude and soil formation would be brought out more clearly, and at the same time subsequent use of the maps in the field be made much easier. Wherever possible on the fells, the contour-lines have been retained as marking the boundary between two plant associations, but in other places where the deviation has been great enough to show on a 1-inch map, a separate boundary-line has been adopted.

The maps are contoured every 100 feet below 1000 feet, and then every 250 feet up to 2000 feet; above this every 500 feet. In the case of a separate boundary-line having been taken at any altitude over 2000 feet, the altitude is indicated on the map, having been obtained by measurement with an aneroid, and carefully checked by the Ordnance bench-marks in the field.

Topography.

The district covers Sheet 31 and part of Sheet 30 of the 1-inch Ordnance Survey. The country may be marked off into two regions, sharply differentiated from each other by topographical, geological, and botanical features.

The north-east part of the map is composed entirely of fell country, intersected by the narrow upland valleys of the Tees, and its two large tributaries, the Lune and Balder. The Pennines here consist of a continuous chain of fells running north-west and south-east, and rising from 1500 feet over the greater part of Stainmore on the south-east to over 2000 feet, on Mickle, Little, Burton, Hilton, Murton, and Dufton Fells on the north-west. The highest point on Mickle Fell runs up to 2591 feet. The whole of this ground is unenclosed and uncultivated, covered with rough moorland gently sloping to the north-east, the numerous streams draining it forming the headwaters of the rivers Lune, Balder, Greta, and Maise Beck. This fell country terminates in a series of bold escarpments on the south-west facing the Eden valley, furrowed by numerous gills, the largest of which are Highcup Gill and Hilton Gill. The drainage from this side of the fells, which is comparatively small in amount, finds its way into the Eden.

The middle and western part of the map lies largely in the Vale of Eden—a broad strip of undulating country, most of which is now under cultivation, and rising from 300 feet in the north near Culgaith to about 800 feet in the south-east.

The south-west part of the map is occupied by Crosby Ravensworth Fell, the ground rising here in a series of limestone terraces to a height of 1315 feet on the south-west, and sloping gently away towards the north-east facing the Eden valley.

Geology.

The Fell districts are entirely composed of the older Carboniferous rocks, sandstones, shales, and limestones. Over the higher parts of the fells most of the ground is covered with a thick deposit of peat, which over the greater part of the area rests upon glacial clay.

The peat reaches its greatest development on the wet type of heather moor, and on the Sphagnum bogs, and may in such situations be over 40 feet in thickness. In the present district I have found the deepest peat to occur on gently sloping ground over 1400 feet and below 2100 feet in height. So general is the distribution of the peat in the heather area that it is difficult to say with certainty the height to which the glacial clay rises, but I have observed it underlying the peat in sections cut by streams at altitudes over 2000 feet. This is the case in several places by Connypot Beck on Warcop Fell, at Hanging Seal on Mickle Fell, and near the head of Merrygill Beck, where exposures of boulder clay can be seen from 1800 feet to 2150 feet.

The chief exposures of bare rock are in the form of scars or narrow bands of limestone, often stretching for considerable distances. The best example of this is to be found on the south side of Mickle Fell. In many cases, however, the scars are covered with a rich soil mixed with

a little peat, but quite sufficient to support a vigorous vegetation, the bare rock only cropping out here and there.

The steep western escarpment of the fells is much freer from drift and peat than the more gently inclined eastern portion, the soil is comparatively thin, and rock exposures are frequent.

The higher portions of Great Asby Scar, near Crosby Ravensworth, are singularly free from drift or peat, the rock forming a bare limestone pavement for some distance.

Much of the ground on each side of the Tees from where it enters the map to as far down as High Force, also Maise Beck from the Crook by Swarth Beck to Birkdale, is formed of basalt, although much of this again is covered with peat except close to the river-sides, and on the cliffs of Cronkley Scar and Widdybank Fell. The Permian and Triassic sandstones and shales which form the Eden valley are in most places covered with a fairly thick deposit of earthy gravels and glacial clay.

Region of Cultivation.

The most striking feature is the relatively large area of pasture land compared with ploughed land. At the present time all the cultivated parts of Teesdale, Lunedale, and Baldersdale included in the map are under permanent pasture, although most of this land lies below 900 feet.

The only ploughed land on the map lies in the Eden valley, and thus in Westmorland. The following figures taken from the Board of Agriculture returns for Westmorland, 1901, illustrates the subdivisions of the area of cultivation :—

Total Acreage under Crops and Grass, 248,702 Acres.

Corn crops	Wheat	130 acres.
	Barley	775 „
	Oats	14,508 „
	Rye	73 „
	Beans	17 „
	Peas	18 „
		15,521 „
Green crops	Potatoes	1440 acres.
	Turnips	5955 „
	Mangold	920 „
	Cabbage	89 „
	Vetch	26 „
	Other grass crops	42 „
		8472 „
Clover sainfoin and grasses under rotation	For hay	7,068 acres.
	Not for hay	9,009 „
		16,077 „
Permanent pasture ...	For hay	53,871 acres.
	Not for hay	154,650 „
		208,521 „

In the portion of the Eden valley under consideration the zone of wheat cultivation is not represented.

Some interesting calculations regarding the limit of wheat cultivation are given in Part I. of the Survey of Yorkshire, and the authors conclude that wheat does not flourish unless—

(1) The mean summer temperature is above 56° Fahr.

(2) The mean rainfall is below 32 inches.

The general limit for successful wheat cultivation is given by Robert Smith (2), as reaching 500 feet on northern slopes, and 700 feet on south-eastern slopes, and the same altitudes appear to limit wheat cultivation in Yorkshire.

The Eden valley lies at an average altitude of over 500 feet, the only part below this being the ground on each side of the Eden north of Appleby, and the mean annual rainfall at the three stations of Appleby, Milburn, and Great Asby gives 32·25, 33·16, and 37·92 inches respectively. (3)

The mean July temperature at Appleby is 56° Fahr., and it may be assumed that this is the maximum temperature for the part of the valley lying in the map. From these figures it will be seen that the most favourable parts of the cultivated area lie about, or rather below, the mean July temperature of successful wheat cultivation, and the rainfall is also slightly in excess of the maximum usual in such areas.

Inasmuch as there is no wheat grown in this area, it affords confirmation of the figures already arrived at from observation in Scotland and Yorkshire.

The upper limit of oats cultivation is fairly definite, ceasing at about 700 to 800 feet along the fellside from Murton to Brough. Although low, this nearly reaches the limits of cultivation. From Brough onwards the oats area falls far short of the limits of cultivation, which here runs up to 1200 feet, while the general cultivation of oats ceases at about 600 feet. Nearly the whole of the ground between the present oats limit and the limit of cultivation has been ploughed in past times, and traces of furrows still remain in much of the area now under permanent pasture in Teesdale as far as High Force, in Lunedale, and in Baldersdale. Thus the line representing the upward limit of oats cultivation is essentially an artificial boundary representing the limits beyond which it is not profitable to grow this crop under present economic conditions.

A consideration of the general flora of the cultivated area is reserved for Part II., as larger and more representative areas occur.

The following table gives the mean annual rainfall at several stations on the present map :—

Zone of vegetation.		Altitudes above sea-level.	M.A. rainfall, inches.
Moors	Shap (Sleddale Hall) ...	1560	68·44
Moors	,, (Swindale)	1610	80·18
Oats	,, (Copy Hill)	852	51·92
Oats	Appleby	442	32·25
Oats	Asby Town Head	685	37·92
Oats	Crosby Ravensworth ...	890	41·03
Oats	Mickleton	1175	34·61
Wheat	Barnard Castle	540	29·64

The figures from Shap, although from stations lying immediately outside the western limits of the map, are included as showing the great increase in rainfall at altitudes over 1400 feet.

Woodland.

All the deciduous and coniferous woods fail to reach an altitude of more than 900 feet, except in one or two instances. The highest point reached by deciduous trees is a small birch wood at Hillbeck at 1000 feet, and in small plantations of pine, spruce, and larch in Teesdale at 1200 feet. Isolated trees, chiefly ash, rowan, and hawthorn, are occasionally found growing as high as 1700 feet in sheltered places, but these are very small, stunted, and often of a shrubby habit. In the Eden valley oak is the predominant tree, although pines, larches, and spruce have been largely planted in recent years.

Oak Woods.

The only district which can be said to be wooded is the Eden valley. Although oak woods and copses run up to 800 feet, they become much more abundant in the northern and middle parts of the valley at altitudes ranging below 600 feet. This strip of country was originally covered with heaths, with oak on the less exposed and damper situations, but most of the original heathland has been reclaimed, and is now under cultivation. Much of the woodland at present is in a transitional state, the tendency being to replant the old oak woods with coniferous trees, chiefly pine and larch. Mixed with the oak are a number of subsidiary trees, the most frequent being *—

Fraxinus Excelsior, L.
Corylus Avellana, L.
Pyrus Aucuparia, Ehrh.
Salix caprea, L.
Salix triandra, L.
Betula verrucosa, Ehrh.
Cratægus Oxyacantha, L.
Acer Campestris, L.

* The nomenclature is that of the London Catalogue of Plants, 9th edit., 1895.

FIG. 1. Spruce wood, showing absence of undergrowth.

FIG. 2. Heather and Nardus grass heath near Birkdale Hush.

Most of the oak woods are fairly dry, the ground being frequently covered with bracken. The chief plants are as follows:—

Anemone nemorosa, L.
Ranunculus repens, L.
R. Ficaria, L.
Actæa spicata, L.
Cardamine pratensis, L.
Arenaria trinervia, L.
Lychnis dioica, L.
Hypericum Androsæmum, L.
Polygala vulgaris, L.
Viola Riviniana, Reich.
Geranium sylvaticum, L.
Oxalis acetosella, L.
Vicia sylvatica, L.
Geum rivale, L.
Potentilla reptans, L.
Potentilla Fragariastrum, Ehrh.
Chrysosplenium oppositifolium, L.
Sanicula europæa, L.
Hedera Helix, L.
Adoxa Moschatellina, L.
Lonicera Periclymenum, L.
Galium saxatile, L.
Solidago Virgaurea, L.
Campanula latifolia, L.
Campanula rotundifolia, L.
Primula acaulis, L.
Lysimachia Nummularia, L.
Myosotis sylvatica, Hoffm.
Veronica montana, L.
Pedicularis sylvatica, L.
Melampyrum pratense, L.
Stachys Betonica, Benth.
Stachys sylvatica, L.
Nepeta Glechoma, Benth.
Teucrium Scorodonia, L.
Ajuga reptans, L.
Mercurialis perennis, L.
Orchis mascula, L.
Scilla verna, Huds.
Luzula maxima, DC.
Luzula venalis, DC.
Carex paniculata, L.
Carex sylvatica, Huds.
Carex remota, L.
Carex pilulifera, L.
Milium effusum, L.
Deschampsia cæspitosa, Beauv.
Melica nutans, L.
Melica uniflora, Retz.
Bromus ramosus, Huds.
Pteris aquilina, L.
Athyrium Felix Fœmina, Roth.
Polypodium vulgare, L.

Birch Woods.—The map only shows two natural birch woods of small extent, the larger being situated on the steep western escarpment of the fells at Hillbeck at about 1000 feet, and the other at Scober, a few miles farther north.

There are also a few birch plantations out in the Eden valley mixed with pine. These mark the remains of what was originally a great development of birch, which stretched from the fells above the Eden valley eastwards and northwards over much of the higher ground round the headwaters of the Tees, Wear, and South Tyne. At Hillbeck the birch is mixed with a number of other deciduous trees, which become more frequent near fringes of the wood.

Ulmus montana, Stokes.
Cratægus Oxyacantha, L.
Alnus glutinosa, Medic.
Salix Caprea, L.
Quercus Robur, L.
Fraxinus excelsior, L.
Ilex Aquifolium, L.
Corylus Avellana, L.

Coniferous trees are entirely absent.

The undergrowth is chiefly herbaceous, there being very little scrub. The dominant plants are—

Viola Riviniana, Reich.
Helianthemum marifolium, Mill.
Geum urbanum, L.
Meconopsis cambrica, Vig.
Primula acaulis, L.
Primula farinosa, L.
Anemone nemorosa, L.
Epilobium montanum, L.
Hedera Helix, L.
Saxifraga hypnoides, L.
S. tridactylites, L.
Pinguicula vulgaris, L.
Digitalis purpurea, L.
Veronica officinalis, L.
Pyrola minor, L.
Scrophularia nodosa, L.
Melampyrum sylvaticum, L.
Sedum acre, L.
Mercurialis perennis, L.
Circæa lutetiana, L.
Sanicula europæa, L.
Teucrium Scorodonia, L.
Urtica dioica, L.
Valeriana sambucifolia, Willd.
Adoxa Moschatellina, L.
Lonicera periclymenum, L.
Orchis mascula, L.
Listera ovata, R. Br.
Allium ursinum, L.
Allium Scorodoprasum, L.
Paris quadrifolia, L.
Melica nutans, L.
Briza media, L.
Luzula venalis, DC.
Convallaria majalis, L.

Coniferous Woods.—None of the numerous small pine woods show any signs of antiquity, having been planted about the same time as the larch and spruce. Most of the woodland of the upper or south-east part of the Eden valley is formed of coniferous trees, principally pine, and such plantations possess an extremely limited flora, except in the small clearings and by streams. In many cases these plantations mark the site of a former oak copse, remains of deciduous trees, chiefly oak, still occurring amongst the pines. This is particularly the case in those pine plantations farther out in the Eden valley away from the fells. Heather is generally absent.

Pine is the most largely planted tree, and appears to flourish well at all altitudes up to 1200 feet, beyond which it is not at present planted on the east side of the Pennines, whilst the highest plantation on the west, bordering on the Eden valley, is under 800 feet. A few small larch plantations have been made on the fell-side between Keisley and Brough, the highest being at 900 feet; but this tree has been planted very sparingly, and generally mixed with either pine, spruce, or deciduous trees.

The coniferous plantations along the fell-side facing the Eden valley have from time to time been thinned by the local north-east wind, or "helm wind," which sweeps with great velocity down the western escarpment and out into the Eden valley for a distance of about 2 miles from the fells. Although flourishing well where planted, the pine shows no disposition to spread, the unenclosed character of the land and presence of sheep preventing the seedlings having any chance of surviving.

Altogether, it will be seen from the map that not only is the area covered with woodland very restricted, but the altitude to which trees ascend is considerably lower than in similar districts in Great Britain. The cause on the western side of the fells is undoubtedly partly due

to the prevalence of the "helm wind" at certain times of the year, but cannot be wholly due to this, as the same tendency is to be seen on the eastern side of the Pennines, although there are deciduous copses running up to 900 feet, and a few coniferous plantations at 1300 feet. That this sparseness of the tree area has not always been the case in the district may be seen from an examination of the peat on the higher fells. Sudden floods near the heads of streams frequently cut back the peat to a depth of 10 or 15 feet, exposing the remains of what has undoubtedly been a wood of large extent. The wood may be seen lying on the surface of the bare peat, and by digging down a few feet better preserved specimens may be obtained. The most usual tree to be met with is the birch. At lower situations poplar (*Populus tremula*), alder, and a few other doubtful specimens have been noted.

The wood generally occurs near the base of the peat where it rests upon glacial clay, and the character of the peat at this level is often very different to that above. Here there is evidence of a distinct layer of "leaf-peat," formed of the remains of fallen leaves, and interlaced with numerous rootlets, although the peat for some distance above may be quite free from fibrous materials.

That remains of trees frequently occur in peat is well known, having been noted in most of the larger peat areas of this country. In the present district, these remains of birch woods may be traced for considerable distances, and generally occur at altitudes far above the present limit of woodland, having been seen in the peat at many places on Mickle Fell, Little Fell, Murton Fell, Hilton and Dufton Fell, and Meldon Hill, and over much of the lower moorland south of the Brough to Middleton road, although, curiously enough, there are fewer trees to be seen here than at higher altitudes. The highest points at which these remains have been observed on the present map are on Mickle Fell at 2200 feet; Meldon Hill, 2350 feet; Dufton Fell, 2230 feet; Murton Fell, 2100 feet.

The difference in altitude of the present and former tree distribution is certainly striking, and in the companion map to the north much higher elevations at which these woods occur have been observed together with the frequent remains of pine wood at 2600 feet, although the birch seems everywhere to have been the dominant tree. It is interesting to note that the highest occurrence of birch woods in the Highlands at the present day is given by Robert Smith in the survey of Scotland as rather under 2000 feet, a few patches only reaching this altitude. Pine only reaches 1800 feet.

So far tree remains have not been observed in any of the Sphagnum bogs. It is hoped that the ground covered by sheet 2 will throw more light upon the distribution of these birch woods, particularly with regard to their distribution upon the glacial clay.

Juniper.—The Juniper is scattered over the carboniferous area in

the heather districts, but only occurs in any quantity for a few miles along the scars by the Tees below Caldron Snout. It first makes its appearance at 1550 feet on Widdybank Fell, growing luxuriantly amongst the basaltic rocks of Falcon Clints. About a mile further down, at Cronkley Scar, it becomes abundant on the south side of the Tees, and from here onwards to High Force forms a marked feature in the vegetation. Scattered bushes also occur along the basaltic cliffs running from Holwick Head to Crossthwaite. Isolated trees of ash and rowan occur below 1200 feet, mixed with juniper, but these are small in size.

The juniper is entirely confined to the exposure of the whin sill (basalt and dolerite) on the Tees side, and does not occur anywhere higher up in Teesdale. The soil here is of a friable, porous character, with a slight mixture of peat. A few bushes also occur on the western escarpment at Swindale Beck, where the whin sill is exposed for a short distance, and a few scattered shrubs were found at the junction of Mawmon Sike and Hunder Beck, near Water Knott, growing on glacial clay.

Pasture Associations.

The area covered by pasture associations forms a fairly broad fringe round the main heather areas, and may be divided into two sections—

I. Natural Pasture, *i.e.* areas in which grasses are predominant, and where the general flora is quite distinct from that of the heather area.

II. Grass heaths, where grasses are still plentiful, generally forming the greater part of the vegetation, but where the general flora belongs to the heather area.

Natural Pasture.—This is well developed wherever the limestone is free from peat and covered with a rich soil. Such areas can generally be recognized long distances away, the bright green of the closely cropped pasture contrasting strongly with the sombre-coloured heather areas and the rough appearance of the grass heaths.

In many cases the plants are so closely cropped by sheep that a determination of the grasses covering the ground is not easy, except by their leaf anatomy. The chief grasses are—

Agrostis vulgaris, With.
Festuca ovina, L.
Scsleria cærulea, Ard.
Koeleria cristata, Pers.
Poa pratensis, L.

Besides this the natural pasture has a fairly rich and varied flora, many plants of the cultivated area being found here also.

Ranunculus acris, L.
R. repens, L.
R. parviflorus, L.
Helianthemum Chamæcistus, Mill.
H. marifolium, Mill.
Viola Riviniana, Reich.
V. tricolor, L.
Polygala vulgaris, L.
**P. amara*, L.
Linum catharticum, L.

Geranium lucidum, L.
Trifolium pratense, L.
T. repens, L.
Lotus corniculatus, L.
Vicia lathyroides, L.
**Potentilla verna*, L. Haenke. Local on limestone ledges.
**Sedum acre*, L.
Saxifraga hypnoides, L.
Cratægus Oxyacantha, L.
Alchemilla vulgaris, L.
Galium saxatile, L.
Scabiosa Succisa, L.
**S. Columbaria*, L.
Carlina vulgaris, L.
Centaurea nigra, L.
**Hieracium Pilosella*, L.
**H. anglicum*, Fries.
**H. murorum*, L.
Campanula rotundifolia, L.
Veronica officinalis, L.
Euphrasia officinalis, L.
Thymus Serpyllum, Fr.
Teucrium Scorodonia, L.
Rumex Acetosa, L.
R. Acetosella, L.
Urtica dioica, L.
Orchis mascula, L.
Habenaria viridis, R. Br.
Briza media, L.

The natural pasture is always well developed on the limestone scars, which in many cases stretch for considerable distances, and are free from peat and drift. The formation is well developed over some of the lower slopes of the western escarpment of the fells, on the south side of Mickle Fell and on the limestone of Great Asby Scar and Crosby Ravensworth Fell.

Grass Heaths.—These may be divided into two well-marked varieties, which, however, often undergo rapid and local changes. Both types are developed upon glacial drift overlaid with a certain amount of peat. The presence or absence of peat in any quantity, and the amount of water present in the soil, determines which variety shall be present in a particular district. The type of grass heaths present under wet conditions of soil, in hollows and depressions of flat, badly drained ground and by springs, is chiefly composed of sedges, rushes, grasses, and a few heather plants. In the wettest places Sphagnum may be present in considerable quantity.

The most frequent grass is *Molinia varia*. A list of plants taken from a spot near Hunder Beck is typical of this formation—

Molinia varia, Schrank.
Deschampsia flexuosa, Trin.
Carex flava, L.
C. echinata, Murr.
C. Goodenovii, J. Gay.
Juncus conglomeratus, L.
J. effusus, L.
J. glaucus, Leers.
Triglochin palustre, L.
Scheuchzeria palustris, L.
Narthecium ossifragum, Huds.
Hydrocotyle vulgaris, L.
Primula farinosa, L.
Lotus uliginosus, Schk.
Calluna Erica, DC.
Erica Tetralix, L. (not common).
Sphagnum, spp.
Lycopodium inundatum, L.

This Molinia heath is the most extensively developed variety, often stretching for miles on gently-sloping, ill-drained ground, and in the autumn often resembling the heather in tint, with the reddish-brown colour of the dying Carices and rushes. It is this type which is

* These plants occur only on rock ledges, in the pasture area.

developed on most of the grass heaths between Lunedale and Baldersdale and on Cotherstone Moor.

The other type of grass heath occurs on steeper and better-drained ground, and is characterized by the great development of *Nardus stricta*. Owing to the presence of this plant, the association can readily be recognized from a distance in the autumn and winter by the almost white colour of the dead stems of the mat weed.

A list of plants from the west slopes of Murton Fell represents the chief plants of the Nardus heath—

Nardus stricta, L.
Juncus squarrosus, L.
Scsleria cærulea, Ard.
Agrostis vulgaris, With.
Potentilla Tormentilla, Scop.
Galium saxatile, L.
Ulex nana, Forster. Does not ascend above 1300 feet.
Vaccinium Myrtillus, L.
Polytrichum Commune.
Lycopodium Clavatum, L.
L. Selago, L.

It is frequently found that a patch of natural or Scar pasture occurs amongst an area of Nardus heath, owing to the limestone cropping to the surface and being free from glacial drift. In such cases a complete transition from the long ragged Nardus formation to natural pasture which has been cropped by sheep as close as a lawn may occur in 2 or 3 feet. The rapid transition from grass heaths to natural pasture can be seen on some parts of the limestone escarpments. In many places the Pennines rise on the south-west in a series of terraces, the steps being formed of scars free from peat and partly covered with good soil, the sloping ground between being covered with glacial drift, so that many of the hillsides show a regular alternation between grass heaths and scar pasture. This can be well seen on the south-east side of Scordale from 900 feet up to about 2000 feet, where the heather area begins.

The two types of grass heaths which have been described here represent respectively the types developed under extreme moisture and dryness.

The Molinia heath is found on wet ground often having a considerable amount of peat, but either too wet or not sufficient in quantity to support a heather type of vegetation. The Nardus heath, on the other hand, grows on glacial drift either with no peat at all or a very thin covering. A well-drained steep slope is the favourite ground for such an association.

Every possible gradation between these two extreme types occur as the conditions change. In some spots one of the species may be present to the total exclusion of others. Thus many patches of ground on the Nardus heath may be occupied exclusively by *Nardus* or by *Juncus squarrosus*.

A marked feature of most of the pasture associations bordering the north-east side of the Eden valley is the growth of scattered hawthorn trees, often of considerable age.

FIG. 3. Nardus grass heath.

FIG. 4. The Tees at Cronkley Scar.
Nardus grass heath to left. Heather on right.

These grow in the most exposed situations, and ascend in many places as high as 1400 feet, higher than any other tree in the district.

Nearly all the specimens are small, with strongly twisted trunks, and often exhibit almost a creeping habit.

Heather Associations.

This is the most characteristic type of vegetation in the district, covering many miles of ground on the Pennines. The relative development of the different types of heather associations is chiefly dependent upon the amount of water held by the soil, and this again is determined by the physical nature of the soil and the solid rock underlying it, slope of the ground, and to a certain extent the altitude.

Eriophorum Moors.

This association is well developed over the southern part of the map, on gently inclined land covered with a deep peat layer with little natural drainage. The flora is very limited, consisting chiefly of the following plants:—

Eriophorum angustifolium, Roth.
E. vaginatum, L.
E. latifolium, Hoppe. At low levels.
Scirpus cæspitosus, L.
Empetrum nigrum, L. Not common.
Calluna Erica, DC.
Erica Tetralix, L.

In this area Sphagnum is generally quite subordinate, and bare peat devoid of any form of vegetation is common. In such a case the peat is often weathered into hillocks or dunes, 10 or 15 feet above the level floor of peat between. During the winter these peat dunes are saturated with water, and constantly cut into fresh shapes by floods and heavy rains, but during the driest part of the year they dry to such a degree that the powdery surface peat is easily weathered by strong winds. Some of these areas are many acres in extent, with the summits of the dunes crowned with a few tufts of Calluna, Empetrum, or Eriophorum, and altogether they have a most forbidding aspect on a misty day. Bare peat areas are occasionally found on the heather moors, and it is suggested that they may be formed by firing the heather late in the spring, when the ground is comparatively dry, when the heather may be burned so low that the roots are scorched and the plants killed. Denudation of the peat then proceeds so rapidly that no fresh vegetation is able to establish itself.

Sphagnum Bogs.—These are developed under conditions of extreme moisture, and often have well-defined boundaries. The flora is almost entirely composed of the following plants:—

Sphagnum, spp. Dominant.
Rubus Chamæmorus, L. Frequent.
Erica Tetralix, L. Frequent.
Vaccinium oxycoccos, L. Frequent.
Eriophorum angustifolium, Roth. Generally present in small quantities.
Empetrum nigrum, L. Generally scarce.
Calluna Erica, DC. Generally very scarce.

The best development of this type of vegetation is to be seen in some of the mosses round Beldoo Hill and Shacklesborough Moss. The general appearance of the Sphagnum bogs varies a good deal from year to year as the rainfall may be large or small.

Heather Moors.

The dominant plant over the whole of the heather area is Calluna, and *Erica Tetralix* only occurs sparingly on some of the lower-lying wet heather moors bordering on Eriophorum bogs and Sphagnum areas. *Erica Cinerea* occurs only in two situations on the map, and in each case on the Coniston slates of the Silurian area, and here only in a scattered condition. A general list of the principal plants from the heather moor is as follows :—

Calluna Erica, DC.
Scripus pauciflorus, Lightf.
Empetrum nigrum, L.
Molinia varia, Schrank.
Vaccinium Myrtillus, L.
V. Vitis Idæa, L.
Erica Tetralix, L. Scarce.
Potentilla silvestris, Neck.
Juncus squarrosus, L.
Eriophorum vaginatum, L.
Nardus stricta, L.
Lycopodium Selago, L.
L. Clavatum, L.

It will be seen by the map that pasture and grass heath is the general formation on the western side of the Pennines until near the summit of the fells, when a heather vegetation covers the ground. Viewed from the Eden valley, the hillsides in the neighbourhood of Hillbeck appear as a series of steep limestone scars, with good natural pasture occurring wherever there is sufficient soil. At about 1500 feet the ground becomes more level, and a thick deposit of peat has collected, maintaining a good heather vegetation. At such places a complete transition often occurs from natural pasture to the thickest heather in a few yards. At other points the transition is less rapid, and it is often extremely difficult to fix the boundary between the grass heath and heather.

If an ascent of Middle Tongue near Highcup Gill be made from the Eden valley, the following zones of vegetation will be passed. Starting from the boundary of the oats area, near Scalehowe Wood, natural pasture will be encountered (sometimes of a rather heathy nature) over sharply undulating hillocks and limestone scars up to 1500 feet, where both the vegetation and the configuration of the ground abruptly changes. At this altitude we arrive at the summit of a bed of limestone, which here forms a fairly level plateau covered with a wet deposit of peat.

As this is a narrow tongue of land bounded on each side by limestone and basaltic cliffs, the soil, although consisting of wet peat, is at the same time too well drained to suit the growth of a well-marked Sphagnum bog, so that we find a well-developed Eriophorum bog, consisting of abundant Eriophorum, Empetrum, *Juncus squarrosus*, and a fair

FIG. 5. Denudation of the peat on Mickle Fell. Depth of channel, 17 feet. Total depth of peat, 26 feet, resting on a thin bed of glacial clay. Remains of birch wood in the background at a depth of 15 feet from the present surface of the peat.

FIG. 6. Heather on Cronkley Fell.

quantity of *Vaccinium Myrtillus*. This formation continues for about half a mile, when the ground again begins to rise in a series of terraces. Here the limestone, instead of being bare or only covered with a layer of thin soil, as we found was the case below 1500 feet, becomes covered with a deposit of wet peaty soil, and on these slopes the vegetation immediately changes to grass heath, with *Molina varia Juncus squarrosus*, Carices, etc. About 1750 feet the ground again becomes more level, with a thick and somewhat drier peat than we found about 1500 feet. This affects another change in the vegetation, the heather-moor type beginning to be dominant, and continuing, with the exception of one or two bands of pasture representing limestone scars, up to 2000 feet, where the heather and Vaccinium association appears.

This illustrates some of the intermediate types frequently noticed between the grass heaths and true heather area caused by small changes in the soil and the slope of the ground.

Vaccinium and Heather Association.

Some consideration was necessary before it was decided to adopt the 2000-feet line as the limit of the Alpine region. The transition from the sub-Alpine to the Alpine region is usually indicated by the disappearance of trees, as found by Flahault in the Pyrenees and Robert Smith in Scotland. On this principle the Alpine region would commence at about 1400 feet, but this is evidently too low, as nearly all the typical plants are absent at this altitude, and only make their appearance at about 1800 feet or 1900 feet.

If the heather area is examined at different altitudes, it is found that a marked change in its character occurs at about 2000 feet (from 1900 to 2050 feet), and from this fact and the appearance of Alpine plants, I decided to take the 2000-feet line as the lower limit of the Alpine region.

In some places the change occurs with great accuracy, but in other cases there is an intermingling between the two types for several hundred feet. The change is quickest and best seen on the western side of the Pennines.

As we approach 2000 feet the Vacciniums (*Myrtillus*, *Vitis Idæa*) increase very greatly in quantity, and Calluna becomes rather stunted and less frequent. This association is very constant in type, long stretches on Dufton Fell, Murton Fell, Hilton and Burton Fell, and Arngill Head consisting exclusively of about six different plants.

Calluna Erica, DC.
Rubus Chamæmorus, L.
Vaccinium Myrtillus, L.
V. Vitis Idæa, L.
V. uliginosum, L. Rare and Local.
Eriophorum vaginatum, L. Generally distributed, but not abundant.
Empetrum nigrum, L.
Melampyrum pratense, L. Local.

Rubus chamæmorus is very typical of this association, being in most places very abundant, and rarely occurring below 2000 feet on the west side of the Pennines, although in some places it runs down as far as 1500 feet in Teesdale and Weardale. In most places on Dufton, Murton, and Mickle Fells it marks the beginning of the Alpine region with great accuracy.

Local changes in the association may occur; in badly drained spots the *Vaccinium Myrtillus* may be almost superseded by Eriophorum and Sphagnum, giving a formation almost equal to the Sphagnum bog, but these areas are so small in size that they could not be represented on a map of the present scale. In well-drained rocky places the Calluna may almost disappear, giving rise to a Vaccinium moor. Such instances can be well seen along Backstone Edge and High Scald Fell, and are better represented on the Northern Sheet. Sphagnum is very generally represented, except in those parts free from Calluna.

The Alpine plants are to be met with only by streams, rocks, and springs. The following list represents those found on the present area :—

Thalictrum alpinum, L.
Draba incana, L.
Viola rupestris, Schmidt.
Polygala amara, L.
Dryas octopetala, L.
Saxifraga nivalis, L. Rare.
S. stellaris, L.
S. Hirculus, L. (4)
S. aizoides, L.
Sedum roseum, Scop.
S. villosum, L.
Epilobium alsinefolium, Vill.
E. anagallidifolium, Lam.
Galium boreale, L.
Vaccinium uliginosum, L.
Gentiana verna, L.
Bartsia alpina, L.
Myosotis alpestris. Schmidt.
Polygonum viviparum, L.
Oxyria digyna, Hill.
Carex capillaris, L.
Kobresia caricina, Willd.

As 2150 feet to 2200 feet is approached, the Vaccinium and Heather association shows signs of dying out, and the ground becomes covered with Alpine pasture and grass heath, all the summits of the hills lying above 2200 feet on the present map being free from heather. The boundary between these two associations is particularly well shown on Little Fell and the south side of Mickle Fell, where the junction between the Vaccinium Heather moors and the Alpine pasture can be traced for miles with considerable accuracy.

The factors determining the boundaries seem to be topographical rather than climatic. Between 2000 and 2200 feet the ground is of the nature of a gently sloping or undulating moorland in most places, with a deep deposit of peat. At about 2150 to 2200 feet the ground rises steeply over limestone scars, and here the soil is generally thin, free from glacial drift, dry in character, with sometimes a small mixture of peat favouring the growth of pasture or grass heath.

Reference to the 1-inch geological map shows that the district is largely a limestone area, with the exception of the Eden valley, and it

FIG. 7. Mickle Fell from the S.E. Boundary of the Vaccinium and Calluna moor, and Alpine pasture just below the limestone scars at 2,200 feet. Heather in the foreground.

FIG. 8. Hillbeck Fell from the Eden Valley. Birch woods on the face of the the scars with pasture above. Heather moor on the summit at 1,500 feet.

is interesting to note how the heather associations are affected by the nature of the underlying rock. Graebner (5) has shown that typical heather formations can thrive in a soil largely impregnated with lime salts. At the same time tracts of limestone are generally covered with a pasture associations. On the present map the greater part of the limestone below 2100 feet is covered with a thick deposit of peat, resting on glacial clay, upon which is developed the heather. As the glacial clay and peat thin out on the scars, so the heather gradually gives place to a pasture association. The depth of peat necessary for the support of heather need not be thick, a few inches being quite sufficient to allow the growth of Calluna, and several areas of limestone are covered in this way, chiefly on Great Asby Scar and Crosby Ravensworth Fell. The actual presence of lime salts in the soil seems to exert no inhibitory effect on the growth of heather.

In many places the Alpine pasture degenerates into a dry grass heath, having very much the same flora as the Nardus heaths of the Alpine regions. Nardus at this altitude, however, is not nearly so abundant, and its place is taken to a great extent by *Juncus squarrosus*. Small stunted plants of Calluna and *Vaccinium Myrtillus*, often not more than 2 or 3 inches high, occur up to the highest ridges.

Many lowland plants run up past the heather associations, and are found in the Alpine pasture area, existing in sheltered spots under the lee of rocks and in shake holes.

The following is a list of those observed :—

Adoxa Moschatellina, L.	Noticed at	2480 feet.
Oxalis Acetosella, L.	„	2500 „
Geranium Robertianum, L.	„	2300 „
Urtica dioica, L.	„	2300 „
Angelica sylvestris, L.	„	2100 „
Viola Riviniana, Reich.	„	2470 „
Geum rivale, L.	„	2250 „
Hypericum pulchrum, L.	„	2200 „
Rubus Saxatilis, L.	„	2400 „
Lychnis dioica, L.	„	2420 „

Above 2500 feet, and on the summits of the higher fells generally, the flora becomes much more scanty, the peat is shallow, and the bare rock frequently exposed. In such situations the flora consists of a few stunted members of the heather and pasture associations, mosses, lichens, and often an entire absence of vegetation, with only bare peat.

The frequent presence of birch wood remains in the peat of most of the heather moors and heather and Vaccinium moors would seem to indicate that the whole of the area has been derived from primitive forest. Further, these remains have not been found on any of the grass heaths, although the peat has frequently been dug out and examined. The present area is perhaps too small to draw any conclusion on this point, but I hope that some of the extensive grass heaths and heather

moors on the northern sheet may throw more light on these forest remains, in relation to the distribution of grass heaths and heather.

Summary.

The range and relative development of the associations distinguished on the map may be compared as follows:—

I. *Temperate Regions.* 300 feet to 1200 feet.

A. Region of cultivation.

1. With oats as chief crop (no wheat): upper limit, 800 to 1000 feet.
2. Permanent pasture reserved for hay: upper limit, 1200 feet.

B. Region of deciduous trees.

1. Oak woods: upper limit, 800 feet.
2. Mixed deciduous trees in sheltered valleys, chiefly ash, alder, rowan, hazel, and hawthorn.

II. *Sub-Alpine Region.*

A. Region of birch and coniferous trees.

1. Coniferous trees, chiefly pine: upper limit, 1300 feet; frequently planted down to 300 feet.
2. Birch woods: upper limit, 1000 feet. Remains of extensive birch woods, mixed with alder and poplar, occur embedded in the peat up to 2350 feet.

B. Region of natural pasture, grass heaths, and heather moors.

1. Grass heaths occur at all altitudes, and are well represented above 1000 feet, generally forming an intermediate zone between the heather moors on the one hand and the natural pasture or cultivation area on the other.
2. Natural pasture occurs at all altitudes. Its development depends upon (1) absence of peat; (2) good drainage.
3. Heather moors with Calluna dominant occur at all altitudes up to 2000 feet.
4. Eriophorum moors or cotton grass bogs occur up to 2000 feet, and reach their greatest development on gently sloping ground at 1200 to 1600 feet.
5. Sphagnum bogs well developed over restricted areas at about 1400 feet.

III. *Alpine Region.*

1. Calluna and Vaccinium association: lower limit, 2000 feet; upper limit, 2200 to 2280 feet.
2. Natural pasture.
3. Grass heaths.
4. Alpine plateau.

Comparison with the North Perthshire area shows that the vegetation of the present district differs from it in the following points :—

1. The average limits of cultivation, particularly of oats cultivation, is very much lower, by an average of about 300 to 400 feet.

2. The upper limits of deciduous trees are lower, coniferous trees poorly represented, and only two examples of natural birch woods, although the remains of these are well represented in the peat at high altitudes.

3. A much greater development of the wetter types of heather and sphagnum associations. On the other hand, the more important plants composing similar associations in the two districts appear to be remarkably constant, with the exception of rare plants peculiar to each district.

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THE OROGRAPHY OF ASIA.*

By Prince P. KROPOTKIN.

III. The Orography of Asia.

In the "General Sketch of the Orography of Siberia," of which the preceding pages are a summary, I indicated in conclusion that the plateaux of Eastern Siberia and Mongolia are undoubtedly a continuation of the plateaux of Western and Central Asia, and that the latter, like the preceding, are fringed, both on the north-west and the south-east, by border-ranges as well as by alpine zones of a certain width. I indicated also in a few words the important part which these massive upheavals must have played in the evolution of the continent of Asia. It is evident that a plateau which stretches across the whole length of Asia is infinitely more important than any chain of mountains, because we know of no alpine chain which would have the same width as the plateau, over 700 miles from Lake Baikal to the Great Khingan. Consequently, the geographer who will forsake the attraction of the

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* Continued from vol. xxiii. p. 207. Map, p. 280.

brilliant colours that are found in the alpine regions and the oceans, and will devote his attention to the study of the rather monotonous character of these massive upheavals and their geographical distribution in connection with the evolution of our planet, as also to their influence upon the distribution of organic life on the surface of the globe, will surely make a series of orogenetic and biological discoveries of the greatest importance.

It was always my intention to undertake some day that study of Asia, but all I have hitherto succeeded in doing in this direction was to give, in the article "Asia" of 'Chambers' Encyclopædia,' a general sketch of the orography of Asia, and to describe in various articles of the 'Encyclopædia Britannica,' both in the ninth edition and the supplement (*Siberia*, *Turkestan*, *East Turkestan*, *Mongolia*, *Altai*, etc.), the orography and the physical features of these regions in conformity with the general views to which I had come concerning the structure of Asia. From the first-named sketch I give here a few abstracts, revised and mostly entirely rewritten, in accordance with the rich materials obtained lately in Central Asia by the Russian, British, Swedish, French, and German explorers. The conclusions arrived at in this study are illustrated by the subjoined Orographical Map of Asia (p. 280).

Two high plateaux are the predominant feature of Asia's orographical structure; they occupy nearly two-fifths of its area. One of them—that of West Asia, including Anatolia, Armenia, and Iran—extends in a south-eastern direction from the Black Sea to the valley of the Indus; while the other—the high plateau of East Asia, still loftier and much more extensive—stretches north-east from the Himalayas to the north-eastern extremity of Asia, resembling in shape a South America which points north-east, and meeting at Bering strait the north-western extremity of the high plateau of North America. These vast regions, mostly unfit for agriculture and human settlement, poorly watered over wide areas, and there assuming the character of dry deserts, divide Asia into two parts—the lowlands of Siberia and the Aral-Caspian depression to the north of the plateau-girdle, and the lowlands of Mesopotamia, India, China and Manchuria, and the peninsulas, to the south. It is easy to understand what an obstacle to mutual intercourse between these two regions was offered by the plateaux.

The Great Plateau of East Asia.—The great plateau of East Asia, which stretches for 4500 miles to the north-east, from the Himalayas, occupies more than one-fifth of the superficies of Asia. Of course, its surface is not quite flat, as the rather inappropriate orographical name of "plateau" might suggest.* It consists of several terraces of unequal

* American geologists have proposed to substitute for it the word "peneplain," but this term has not taken. The word "plain" offers the same inconvenience as "plateau." Russian geographers use the words "massive upheaval" or "terrace;" but the former is not expressive enough.

altitude, and it has its relative depressions. It has also on its north-western borders several broad trenches which are cut in its mass, like gigantic railway cuttings, leading with an imperceptible gradient from the lowlands to the plateaux. For many consecutive geological periods these trenches were either channels for the drainage of the waters discharged by the plateau, or else gulfs of the seas which surrounded it, so that now their banks, water and glacier worn, appear like chains of mountains to the traveller who follows their flat bottoms. The plateau has also its mountain-ridges rising above its surface, and it has its high, and in places gigantic, border-ranges. But its depressions do not sink to the level of the lowlands, their lowest parts being still 2000 or 3000 feet above the sea; while the chains of mountains, although rising to high absolute altitudes, are still relatively low, as their base is upon the level of the plateau, or they appear as the border-ranges of the different terraces. They do not offer the variety of aspects of alpine tracts, intersected by deep fertile valleys. Unvaried monotony—monotony of orographical features, climate, flora, and fauna—remains the distinctive feature of the plateau over immense distances. Over thousands of miles the traveller finds the same broad and open valleys, the same harsh climate, the same species of plants and animals, the same unfitness for agriculture.

All along its borders the great plateau of East Asia is fringed by lofty border-ranges and by outlying zones of alpine highlands: the Himalayas in the south-west; the Tian-shan, the Altai, the Sayan, the Barguzin, the North Muya, and the Konam mountains along its north-western border; and the Great Khingan along its south-eastern border, this last range joining, in all probability, the Himalayas at its southern end, and the Jugjur, or Stanovoi, near the Sea of Okhotsk, at its northern end.

Several terraces can be distinguished in this plateau. (1) The lofty terrace of Tibet, which must itself be subdivided into two terraces, and has a sort of appendage in the Pamirs; (2) North-Western Mongolia, which is continued in the Vitim plateau; and (3) the lower terrace, which includes both the Tarim depression of East Turkestan and the Gobi. It must be remarked, however, that these different terraces do not gradually merge into each other, but that they are sharply separated by distinct border-ranges which have one foot on the upper terrace, and the other foot on the lower one, thus facing the latter by a well-defined escarpment, which is very often accompanied on its outer side by one or two chains of mountains similar to the outer walls of fortifications. A striking feature of these border-ranges is that, apart from quite local deviations, nearly all of them have the direction of either south-west to north-east, or from west-north-west to east-south-east, thus forming parallelograms similar to Bohemia, but on a much larger scale.

The Tibet Terrace.—The highest portion of the Great Plateau is in Tibet, where it has a width of 1600 miles from west to east, and, in its highest terrace—South-Western Tibet—attains an average height of 15,000 feet. Even the bottoms of the deepest valleys are here at a higher altitude than the summit of Mont Blanc, and only cattle-breeding is possible in these high, cold, dry valleys. This highest plateau of the Earth is girdled along its south-western border by the highest chain of mountains—the Himalayas—a typical "border-ridge," which has one foot on the high plateau, and the other in valleys 10,000 to 15,000 feet deeper, where the palm and the vine grow freely, while only alpine pasturages are met with where it gently slopes towards the heights of the plateau. A series of chains of mountains, having their foot on the plateau and separated from each other by high longitudinal valleys, 14,000 to 15,000 feet of altitude, run parallel to the Himalayas, and of these, the Karakoram mountains rise high above the snow-line, their loftiest peak, the Dapsang, being only 300 feet lower than the Gaurisankar. A belt, about 200 miles wide, of open plateau land, 14,000 to 15,000 feet high, extremely dreary, and covered with numerous lakes, separates these mountains from the next belt of the same plateau, which is intersected by numerous parallel chains rising a few thousand feet above its surface, and all running west-north-west to east-south-east, or north-west to south-east. The border-range of this high terrace is reached in the mighty snow-clad Prjevalsky and Marco Polo ranges, which, with their outer walls (Columbus, Tsaidam range), run in the same direction, having their southern foot on the upper terrace, while their north-eastern slopes face the next terrace, *i.e.* the Tsaidam plains. Another, also mighty and snow-clad range of mountains, which was formerly known as the Kuen-lun, but is now better known under its local names of Keria and Russian ranges, represents the north-western border-ridge of this terrace (from 80° to 86° E. long.). It runs south-west to north-east, having its south-eastern foot on the plateau, while at its north-western foot we find the East Turkestan oases of Khotan, Keria, etc. The great Altyn-tagh (Astyn-tagh of Bogdanovich), which continues in the same direction, forms the north-western border-ridge of the Tsaidam terrace, as far as the 92nd degree of longitude, where the border of the terrace turns south-eastwards, and is made, as far as the sharp bending of the Hoang-ho, in 104° E. long., by the Humboldt range and its continuation (Ki-lien-shan?).*

It also appears probable that Eastern Tibet, *i.e.* the region of the upper tributaries of the upper Blue river and the Mekong, represents another terrace of the Tibet plateau. That this region has the characteristics of a deeply ravined plateau, into which the tributaries

* The map which best expresses this structure of these plateaux and border-ranges is the just-published map of Central Asia in Stieler's 'Hand Atlas.'

of the Yang-tse and the Mekong are deeply sunk, appears clearly from Kozloff's last expedition. However, this terrace is lower than that of Western Tibet, and I venture to suggest that it is the chain of mountains (Tan-ola ?) which runs from 30° N. lat. to 90° E. long., towards the north-east (see Wegener's map of the Kuen-lun), which is the border-ridge of the former and separates the two terraces (Tengri-nor, on the upper terrace, 14,200 feet; Lhassa, on the lower, 11,800 feet). The north-eastern border-range of this terrace is evidently the Ame-machin (Amne?), which, we now know, is a continuation of the Burkhan-budda range, and runs due south-east (not east-south-east), which direction is also followed by the high range which separates here the Yellow from the Blue river.

As to the south-eastern border of this terrace, and consequently of the Tibet plateau altogether, our maps still continue to contain in this part of Asia a blank which has been only partially filled up by the surveys of Rockhill, Kozloff, Futterer, and Potanin. From these surveys we see that instead of the mountains running west to east, or east-south-east, under the names of Tsin-ling-shan, Min-shan, etc., which were formerly traced in the south of the Hoang-ho, we have here the terrace-like slopes, marked by three escarpments, running due north-east to south-west, by which the plateau descends towards the plains of China. This is perfectly well seen on the large scale-map of the Han-su expedition, which was published by the Russian Geographical Society in 1891, and embodied the surveys of Skassi.* It thus renders more and more probable the supposition which I formerly ventured to express with great caution only; namely, that the Great Khingan, which is the eastern border-range of the Great Plateau of East Asia, joins the Himalayas, and that consequently in the region (29° N., 117° E.) where we have on our maps fan-like chains of mountains radiating between the Salwen, the Mekong, and the Blue river, there are simply narrow gorges, through which these rivers descend from the plateau.

The Pamirs.—In the north-west the Tibet plateau joins another, much smaller, but also very high plateau—that of Pamir ("the roof of the world"), which covers an area of about 37,000 square miles. An immense range of mountains, which runs north-west to south-east, parallel to the Karakoram range, snow-clad, and containing the 25,800-feet-high Mus-tag-ata peak, fringes this plateau on its north-eastern border and falls with a very steep slope towards the 4000-feet-high

* One sees at a glance on this map that the Hoang-ho, after having described, on the surface of the plateau, a great curve to the north, descends from the plateau where it flows due south, towards its junction with the Wei-shui. The correct position of the escarpment farther south-west is also well given by the following altitudes. Tsin-choi, on the Wei-shui, 4750 feet; Hoi, 4200 feet; mountain pass before Mian, 5200 feet; Han-chun-fu, 30 miles only to the south-east of the former, but on the south-eastern slope of the escarpment, 2020 feet; and Tsi-yan-sian, on the upper Han-tsian river, beyond the last escarpment, that is, already on the plains, 1060 feet.

plains of Kashgaria. Several chains of mountains, running south-west to north-east, and rising to 16,000 and 18,000 feet, diversify the surface of the Pamir; but still, the traveller who crosses it does not descend to a level lower than from 10,000 to 11,000 feet until he has reached its northern border-range, the Trans-Alai mountains, where Kaufmann Peak raises its snow-clad summit to an altitude of 23,000 feet. These last mountains, having their southern foot on the 13,000-feet-high level of the Pamirs, and their northern foot in the broad and flat Alai valley, at a level of from 10,000 to 8000 feet, have the typical character of a true border-range, while the Alai valley offers a striking likeness to the above-mentioned "longitudinal valleys" at the foot of the plateau in East Siberia.*

The Tian-shan Alpine Zone.—Farther north and east of the Pamir plateau, a wide, intricate complex of many high chains of mountains running mostly north-east or east-north-east, with several ridges shooting to north-west, covers an area nearly as large as Germany. These mountains are known under the general name of Tian-shan. The sub-division of this large alpine zone into its different components, and the determination of the exact directions of the different mountain ranges, is very far from being completed. However, it is certain that in proportion as the mapping of the region grows more perfect, it becomes more and more apparent that—as was indicated by Mushketoff in his work, 'Turkestan' (the best work still on this region)—the two main directions of mountain ranges in the Tian-shan are south-west to north-east [that is, parallel to the fringe of the great plateau of East Asia] and south-east to north-west, which direction is taken by several ranges shooting off the Tian-shan. The former is the oldest; the mountains following it have been lifted up during the Palæozoic period, while the other line of upheavals was relatively modern, and attained its greatest force during the Tertiary and Post-Tertiary periods. It may also be going on still. The prevalence of the south-west to north-east upheavals becomes more and more apparent on recent maps, and I venture to surmise that when we know better the orography and the geology of Badakshan, Roshan, etc., we shall probably find that it is the necessity of piercing its way through the south-western continuation of the Trans-Alai border-range that compels the Upper Amu to describe its remarkable great bend before it issues into the lowlands, exactly in the same way as the Yellow river does at the other extremity of the plateau.

The Tian-shan mountains represent a typical alpine zone. The

* From the just-published volume, 'The Bukhara Highlands' ('Gornaya Bukhara,' by Lipski), it appears that the Alai valley is continued in a south-eastern direction between the Hissar range in the north-west and the range of Peter the Great in the south-east—this latter having, like the Trans-Alai, the character of a border-range (to be noticed in an early number of the *Geographical Journal*).

crests of the mountain ranges are mostly snow-clad, the great Khan-tengri rising to 24,000 feet, and mighty glaciers creeping from the chief groups of peaks; even the outer ranges raise their summits to 15,000 and 16,000 feet, that is, above the upper limits of tree vegetation, while in the deep, warm, and fertile valleys, which have been transformed into real gardens by irrigation, the cotton tree and the peach tree grow. The border-range and the alpine zone which fringes it, interrupted only by the Jungarian trench, continues further north-east, to join the border-range of the Altai.

The Lower Terrace of the Plateau.—It has already been mentioned that the lofty terrace of Tibet is fringed along its northern border by a succession of high border-ranges which reach over 20,000 feet in their highest peaks, and separate the upper terrace from the great Central Asian depression, which is occupied by Eastern Turkestan in the west, and the Gobi in the east, thus including the Han-hai, or the supposed dried-up Central Asian Mediterranean. This great "depression," however, is only relative, in comparison with the high plateaux which surround it, and represents, on the contrary, a vast, massive swelling of the Earth's crust. In its western portion it has still an altitude of from 3000 to 4000 feet, and 2600 feet in its lower part, the depression of the Lob-nor; in the Gobi, its altitudes vary from 2500 to 3500 feet, and 4000 feet as one approaches the Great Khingan border-range; while in the flat swelling of the Bei-shan the parallel rows of hills of which this swelling is composed attain about 6000 feet. We have thus, in the Tarim basin and the Gobi, an immense territory, of which less than one-tenth has altitudes below 3000 feet, but nowhere below 2500 feet, while the remainder of it lies at altitudes of from 3000 to 4000 feet. This massive upheaval, consequently, fully deserves the name of "Lower Terrace of the High Plateau." It has no outlet to the sea—not even to Lake Aral or the Caspian. The winds which might bring the moisture of the ocean are deprived of it in crossing the higher plateaux and border-ridges which surround it, and this immense area is rapidly drying up. All through the historical period it has continued to dry up, till Lob-nor, which covers an area four times as large as that of the Lake of Geneva, has become now but a wide marsh, with a maximum depth of some 15 feet—a small remnant of a great lake which existed at the dawn of history, and in whose rapid desiccation we probably must look for one of the causes which impelled the Huns and the Mongols to their great migrations towards the west. Human settlements, secluded from the rest of the continent, and visited at rare intervals by a few caravans, are scattered only in the upper parts of the tributaries of the Tarim, at Barkul, Hami, on the plains of Tsaidam, where the water of few and scanty rivers may maintain life; but they were much more numerous before, as is testified by ruins of great cities, now buried under the drifting sands.

In the East Gobi, where the south-east monsoons of the Pacific during the summer, and the north-west winds from Siberia during the winter, still bring some moisture, the gravelly soil is still covered with grass for a few months each year; but in the west, man must maintain a hard struggle against the moving sands raised by storms in the air, and more dreaded than the worst snow-storms of the far North. In the south-east, towards the chains of Ala-shan and In-shan, the wild horse and the wild camel find still their last refuge on the lonely pastures scarcely ever visited by man.

The wide extension, in both Eastern Turkestan and the Gobi, of red sandstones, conglomerates, and marls, deposited on the superficies of the plateau, led to the supposition that both the basin of the Tarim and the Gobi had been covered during the Mesozoic, or maybe during the Tertiary, period by a Mediterranean—the Han-hai. The find, by Stoliczka, in the mountains near Kashgar and Yanghi-hissar, of fossils which he described, after a rapid examination on the spot, as Triassic, confirmed this supposition. It has been proved, however, lately, by Bogdanovich and Chernysheff, that Stoliczka's fossils were undoubtedly Devonian (Middle Devonian), and not Mesozoic.* Moreover, both Bogdanovich and Obrucheff, after a two-years' careful search all over Kashgaria and the Gobi for any traces of a Mesozoic or Tertiary sea, found none, although the latter devoted special attention to the red, so-called "Han-hai sea deposits." All other expeditions came to the same negative result. It may consequently be said, in conformity with what was remarked concerning East Siberia, that the lower terrace of the plateau has not been under the sea since Palæozoic times. Nay, even the Carboniferous deposits, which are found in the Kashgarian mountains, penetrate only into a few valleys, and induced Bogdanovich to make the remark that the whole configuration of these mountains was accomplished before the Carboniferous sea entered the valleys. As to the red deposits, he was sorry to acknowledge that he had found no organic remains "to show their belonging to the Tertiary system" (l.c. p. 65).

The Jungarian Trench.—The complex of dry and barren mountains which is described as the Eastern Tian-shan, and runs from west-north-west to east-south-east, reaching with its summits a considerable height (10,000 to 13,000 feet), separates the Kashgarian portion of the lower terrace from the Jungarian trench, which leads with a gentle gradient from the plains of Western Siberia and those of Lake Balkhash to

* "The Devonian deposits were found by me quite certainly at the very same spot—to the north of Chon-terek—where Stoliczka found his Triassic fossils. . . . This was undoubtedly a mistake, which Stoliczka could have made the more easily as he was there at the most unfavourable part of the year—January, when it was hardly possible to examine the fossils on the spot; and it was not given to this gifted and undefatigable geologist to examine them on his return home" (Bogdanovich, in 'Works of the Tibet Expedition of 1889-90,' vol. iii. p. 60).

the level of the plateau. In the Kulja valley, the Balkhash plains penetrate eastwards into the alpine highlands, up the valley of the Ili river; and the town of Kulja (2200 feet) stands but a little above the level of Lake Balkhash, while the 2000-feet contour line penetrates up the valleys of the Ili and the Kunghes nearly 100 miles eastward of the town of Kulja. However, at its upper end this valley is barred by high mountains of the border-range—a continuation of the Kokshal-tau and the Sary-yassy range (Khan-tengri peak, 24,000 feet)—which must be crossed before one reaches the plateau.

The Jungarian trench, on the contrary, leads from both the Balkhash and the Irtysh plains to the very heart of the plateau—the Gobi—with a very gentle gradient. It thus forms between the two steep escarpments—of the Eastern Tian-shan in the south, and of the Chinese or Ektag Altai in the north—a broad depression, covered with dry prairies, which gently rises to a higher level as one moves eastward. It was very truly described by historians as the Jungarian Gate, because it was down this gently sloping trench that the Mongol inhabitants of the plateau went westwards to invade the Ural region and Europe. The 700-feet-high Lake Ebi-nor lies at its entrance; and a succession of smaller lakes (Ayar) and of large, recently desiccated lakes of which one sees still the marshy bottoms along the northern foot of the Eastern Tian-shan, represent an elongated depression (1500 to 2000 feet) which brings the 2000-feet contour line to the 91st meridian (in the Borten Gobi, slightly to the north of Guchen and Barkul). This depression, which thus fully deserves the name of a *trench*, is joined in its middle part by another, which also penetrates into the massive plateau east-south-eastwards, from Lake Zaisan, up the Black Irtysh. Lake Zaisan, at its entrance, lies at an altitude of 1300 feet, and Ulungur of 1530 feet; but up this trench, too, the 2000-feet contour line penetrates only for 80 or 85 miles (up the Urungu river, till the 88th degree of longitude). As for the 3000-feet contour, it closely follows upon the former, and only a narrow stretch of land, from 2000 to 3000 feet of altitude, penetrates in the shape of a narrow gulf for another 120 miles on the northern slope of the Eastern Tian-shan (see Fig. 7).

Another extremely interesting depression—the Turfan, or Lukchun depression—appears in these longitudes on the southern slope of the Eastern Tian-shan. The Tian-shan comes here to an end; but it still reaches, in the Bogdo-ola mountain (80° 30′ E. long.), 12,080 feet, and 10,380 feet in the Builuk pass (90° 30′ E. long.). Just at the southern foot of this portion of the Tian-shan, between it and its branch (the Chol-tau and the Kuruk-tagh, which both rise about 2500 feet above the 2500-feet level of the plateau), we see the Turfan depression. It has the shape of a narrow strip of land, nearly 200 miles long and 50 miles wide, between Turfan and Hami, of which the surface is below the 2500-feet level. At Lake Bojante-kul, which is only a small remainder

of a formerly much greater elongated lake, the altitude goes even below the sea-level (130 feet), on an area about 55 miles long and 20 miles wide; while the 1000-feet contour line encloses a space about 25 miles wide which may have a length of 120 miles * (see Fig. 7).

We have here evidently the remnant of a lake, which received during a succession of geological periods the waters, and also, in all probability, the tremendous glaciers, which covered the Eastern Tian-shan. Masses of ice necessarily accumulated here, eroding the bottom

FIG. 7.

of that lake before they could find an outlet to the Jungarian trench, along the Urumchi-Turfan valley, and across the now 3100-feet-high pass.

The arrangement of such deep depressions, all below sea-level, along the northern border of the plateaux of East Asia, is extremely suggestive, and deserves to be specially noted. We see three such

* See Roborovsky's map in 'Memoirs (Trudy) of the Expedition of 1893-95 to Central Asia,' vol. iii., 1899; and map of Grum Grjimailo in 'Journey to Western China,' vol. ii., 1899.

depressions along the rim of the plateaus—the Caspian sea, the Lukchun depression, and Lake Baikal, each where there is a gulf-like or a fjord-like indentation in the rim of the plateau. There may have been an orogenetic cause of this arrangement, the deepest cavity appearing where the upheaval of the border-range gave the steepest slope; but glacial erosion must also have been at work, the excavating force being most powerful at the head of such indentations, just as it is strongest in alpine cirques, or at the head of a fjord (see above, Fig. 5).

Northern Part of the Great Plateau.—Beyond the Jungarian trench the plateau rises again in North-Western Mongolia, and reaches an average height of from 4000 to more than 5000 feet in the upper parts of the Yenisei and Selenga, and about 2000 feet in its lowest part—the small depression of Lake Ubsa-nor. The Ektagh (or Great Altai) in the west, the Khan-gai and the Yablonovoi ridge farther east, separate this upper terrace of the plateau from the above lower terrace of East Turkestan and Gobi. The real structure of these ridges is but very imperfectly known. We learn, however, from recent exploration, that the Ektagh Altai is a typical border-ridge, which has its northern foot on the plateau of North-West Mongolia, and its southern foot in the Jungarian trench. It also appears very probable that the Yablonovoi ridge, which is, in Transbaikalia, a distinct border-ridge of the higher terrace, and the Kentei, which plays the same part about Urga, are continued farther south-west by a succession of ridges which probably join the Tian-shan Pelau (Eastern Tian-shan), and separate the higher Siberian and north-west Mongolian terrace of the plateau from the lower terrace of the Gobi. As to this last (see the Orography of Siberia), it has in the east its border-ridge, the Great Khingan (5000 to 8000 feet), which is a continuation of the mountains of the Middle Hoang-ho; it is pierced by the Amur below Albazin, and in the north-east joins the Stanovoi (Jugjur), or Okhotsk coast-ridge.

In the north-west the High Plateau is bordered by the snow-clad Sailughem ridge of the Altai (8000 to 9000 feet), which appears as a continuation of the Tian-shan, and is continued farther north-east by the Western Sayans and the Eastern Sayans, which latter seem to run north-west to south-east in its western portion, and south-west to north-east further on. A wide indentation, however, occupied in its deepest parts by Lake Baikal (and very much like the indentation made by the Caspian in the plateau of Western Asia), breaks the continuity of the border-ridge. This last reappears again in the east of the great Siberian lake as a huge wall, known under the names of Khamar-daban, Barguzin, Muya, and Chara mountains. These mighty border-ranges rise from 6000 to 8000 feet above the sea, reaching the snow-line only in the Munku-Sardyk (11,900 feet), and presenting their steepest slopes towards the north-west, while their inner base lies on a plateau 3500 to 4500 feet high. This immense wall is pierced by the broad trench-like

valleys of the Selenga and its tributary the Uda, which are the two great highways from Lake Baikal to Mongolia and the Upper Amur.

A broad alpine zone more than 150 miles wide and 2000 miles long —the Tian-shan, the Altai, the Kuznetski Ala-tau, the Baikal, Lena, Olekma, and Vitim mountains—fringes this plateau on the west, from the Amu-daria to the far north-east of Siberia. It consists of a series of chains, mostly running north-east, with numerous spurs, and intersected by deep and narrow valleys, rich in alluvial and diluvial auriferous deposits; while all along the lower edge of the plateau we find a succession of broad valleys.

A like succession of alpine tracts, although narrower, follows the south-eastern edge of the plateau in China and Manchuria, *i.e.* the Great Khingan. As to the plateau itself—whose surface is diversified by several chains rising above its level—its broad, flat, and open valleys, unfit for agriculture in consequence of their altitude, have none of the dryness of the plateau of Tibet. They are covered with a rich grass-vegetation, and are frequented by shepherds; while the slopes of the hills, thickly clothed with forests, are rich hunting-grounds. Farther north—in the Vitim plateau, the Uchur, etc.—the surface of the plateau becomes very marshy; its height does not now exceed 3500 feet, and it becomes narrower. Its north-eastern extremity—the abode of the Chukchis—is but very little known.

The Plateau of Western Asia.—Several parallel chains of mountains, reaching 24,000 feet in their highest parts, and running north-east to south-west—the Hindu-Kush and its parallel chains—connect the great plateau of East Asia with that of West Asia, which may be subdivided into three parts: Iran, Armenia, and Asia Minor. The plateau of Iran (425,000 square miles) is bordered on the north-east by the border-ridges of the Hindu-kush, the Kopet-dagh, which presents its steep, stony slopes to the Turkoman steppes, and the Elburz (with its peak Demavend, 20,100 feet high), which describes a curve around the South Caspian shore; in the east it is fringed by several snow-clad chains, which separate the stony plateaux of Afghanistan and Baluchistan from the fertile valley of the Indus; and in the south it falls by several steep terraces towards the Persian gulf and its continuation—the valley of the Tigris and the Euphrates. The lowest parts of the Iran plateau, in the valley of the Helmand, which discharges its water into the rapidly desiccating Lake Hamun, are 3500 feet above the sea, and although fertile in the south-east, assume the character of a wide salt-steppe towards the Caspian sea. There the Iran plateau joins the plateau of Armenia, bounded on the north by the Anti-Caucasus, and on the south by the Kurdistan mountains. The great salt lakes Van and Urmia have their levels at altitudes of more than 5000 feet; and Mount Ararat, which rises on the plateau, reaches a height of 16,969 feet. Farther

west, the plateau of Armenia meets that of Asia Minor, all three together making a wide plateau, elongated towards the north-west, and having a length of 2700 miles and a width of from 700 to 180 miles. Several chains of mountains, running some of them north-east and others north-west, and reaching more than 10,000 feet in their loftiest summits, intersect the plateau of Asia Minor, which is bordered by the Taurus mountains on its Mediterranean coasts, and the Pontic mountains on the Black sea shore, which run south-west to north-east.

Separate Chains of Mountains.—The mountainous tracts of Asia are not confined to the plateaux and their border-ridges. The Caucasus, an immense wall of snow-clad mountains, stretches north-west to south-east for nearly 900 miles along the border of the Armenian plateau, from which it is separated by the broad valley of the Kura. It reaches 18,560 feet in the Elbruz. The Urals, from 2000 to 4000 feet high, which separate Europe from Asia, are a broad belt of hilly tracts, stretching as a whole from north to south.* Farther east, the Kara-tau and the Tarbagatai, as also the Verkhoyansk ridge in the far north, shoot off the alpine tracts which fringe the plateau, and have a direction perpendicular to them; while the Byrranga hills diversify the monotony of the tundras of the Taimyr peninsula. The Yeniseisk mountains, consisting of several chains running south-west to north-east, contain rich treasures of gold-dust. Several chains, little known, and some of them volcanic, fill up the peninsula of Kamchatka. A number of parallel chains, 5000 to 7000 feet high—the Ilkhuri-alin, the Bureya mountains, Pribrezhnyi, and Tartar—run from the Gulf of Pechili to the Sea of Okhotsk, and seem to be continued in Sakhalin island; while other chains having the same direction form an outer submarine wall of Asia in Korea, the Japan archipelago, and the Kuriles. The Nan-ling, Tayu-ling, and other smaller chains having also the same north-eastern direction, cross South China parallel to the southern border of the plateau;† and submarine chains belonging to the same system of foldings of the earth-crust are seen in the islands of Formosa and Lu-chu (Liu-kiu). The Seravak chain of Borneo, continued north-east in the Palawan islands, as also the mountains of Celebes, have the same direction; while the mountains of Sumatra and Malacca assume the perpendicular north-western direction which prevails in South-West Asia. A range of lofty volcanoes rises steeply from the very depths of the ocean in the islands of the Java sea. As to the real orography of Burma and Siam, it still remains hardly known.

The interior of the Indian peninsula is again occupied by the wide plateau of the Dekkan, having an average height of from 1500 to 3000

* For more details, see the article "Urals" in the 9th edition of the 'Encyclopædia Britannica.'

† See the articles "Mongolia" and "Gobi" in the Supplement to the 9th edition of the 'Encyclopædia Britannica.'

feet, bordered in the west by the Western Ghats (7870 feet high in Nila Ghiri peak) and the Cardaman mountains, and in the east by the much lower and broader Eastern Ghats. The Pedrotallagalla peak in Ceylon rises 8330 feet high. The immense plateaux of Arabia, covered with sand-deserts interspersed with a few fertile regions, rise to altitudes of from 3500 to 4500 feet, and are intersected by several little-known chains of hills. Their south-eastern border-ridge—the Hadramaut—reaches nearly 7000 feet in its highest summits, and the north-western border-ridges—the Lebanon and Anti-Lebanon—have summits nearly 10,000 feet high; while in the deep valley of the Jordan the Dead sea is sunk to a level of 1185 feet below that of the ocean.

Lowlands, Plains.—The whole of North-Western Asia is occupied by an immense lowland—Western Siberia—which is separated from the wide Aral-Caspian depression by the low and flat Obi-and-Aral watershed, dotted with countless lakes. The lowlands of West Siberia, whose level is less than 500 or 600 feet, do not reach the outer borders of the above-mentioned alpine regions which fringe the great plateau of East Asia. They are separated from them by a belt of elevated undulating plain rising to a level of from 1000 to 1500 feet, the limits of which may be roughly indicated by a line traced from Merv to Tomsk, and thence to Verkhoyansk. These plains, which assume the character of dry steppe towards the south, are elsewhere highly suitable for agriculture and cattle-breeding. Not so the lowlands proper, which bear unmistakable traces of having emerged from the sea during the Post-Pliocene period. In the Aral-Caspian depression they often have the character of sandy deserts, and can be cultivated only where there is a belt of fertile loess at the base of the mountains, and the streams issuing from the hilly regions yield sufficient water for irrigation. On the northern coast of the Caspian, the Aral-Caspian depression descends even below the level of the sea; while the dry plateau of Ust Urt rises above the depression to an average height of about 700 feet.* The southern parts of Western Siberia are a perfect granary, and are rapidly being colonized; but beyond the 56th or 57th degrees of latitude the lowland assumes the character of marshy forests, almost quite unsuitable for settlement; and farther north, those of a treeless, barren, and ever-frozen tundra.

A similar belt of elevated plain, succeeded by one of lowlands, runs along the great plateau on its south-eastern edge; and those parts of the plain which are covered in China with loess, as also those of Manchuria to the west of the Pribrezhnyi ridge, are the abodes of a dense agricultural population. In the Indo-Chinese peninsula the lowlands are limited to Tongking, Cambodia, and the Lower Menam, where they are fertile, but often marshy, low plains.

The wide space between the great plateaux of Western Asia and Eastern Asia and that of the Dekkan, watered by the Indus and the

* 2500 feet in the Manghishlak hills.

Ganges, is again an immense lowland, covering no less than 400,000 square miles, and affording the means of existence to 125 millions of inhabitants. Its western portion suffers much from want of irrigation; but artificial canalization rapidly conquers the desert. Mesopotamia, or the broad valley of the Tigris and Euphrates, is again a wide lowland, which was a cradle of civilization in the remotest antiquity. Finally, the fertile lowlands in the north of the Caucasus are being rapidly colonized by Russian agriculturists.

IV. The Geology and Geo-Botany of Asia in connection with its Orography.

The time has not yet come when the geological history of Asia can be written in full. It appears, however, that, with the exception of a marginal zone in the south, which belongs to the Himalayan upheavals, the great plateaux of East Asia are built up of crystalline unstratified rocks, granites, granitites, syenites, and diorites, as well as of gneisses, talc, and mica-schists, clay-slates, and limestones, which all belong to the Archæan formation (Huronian, Laurentian, Silurian, and partly Devonian). They thus cannot have been submerged by the sea since the Devonian epoch. The higher terrace of the plateau of Pamir and the plateaux of the Selenga and the Vitim are formed only of Huronian and Laurentian azoic schists; even Silurian deposits—widely spread on the plains—are doubtful on the plateaux. Their upheaval must date accordingly from an earlier age, and they must have been a continent during the Devonian epoch, while parts at least of the lower terrace were under the sea at that period. During the Jurassic and Tertiary periods immense fresh-water basins covered the surface of those plateaux; they have left their traces in Jurassic coal-beds, and in Tertiary sands and conglomerates, these latter appearing in mighty layers on the borders and slopes of the plateaux. The chains of mountains which fringe the plateaux along their north-western and south-eastern borders are of the same ancient geological origin. They rose above the Carboniferous, Triassic, Chalk, and Jurassic seas which covered what are now the lowlands and lower terraces of Asia; the upheaval of these chains has, however, continued throughout these epochs, so that in the outer chains of Asia we see Carboniferous and younger deposits, up to Tertiary, lifted up to great heights. The same is true of the border-ranges along the south-western border of the great plateau of East Asia, namely, the Himalayas, which were lifted during the Tertiary age, while at their northern foot, on the surface of what is now the surface of the plateau, traces of Triassic deposits seem to have been found near Lhasa.* Carboniferous deposits are met with in Turkestan, India, and Western Asia; while in Eastern Asia,

* I take this on the authority of Dr. Blanford.

the numerous coal-beds of Manchuria, China, and the archipelagoes are all Jurassic. As to the age of the plateaux of Western Asia, it remains unknown at the present time.

What are now the lowlands of Asia must have been widely submerged by the seas of the Tertiary period, as also those of the Quaternary (Post-Pliocene) period. During this last period, the whole of the lowlands of North-West Siberia were under the sea, as far as the 50th degree of latitude, a broad gulf of the Arctic ocean penetrating at the eastern foot of the Urals as far as the watershed which now separates the basin of the Obi from the Aral-Caspian sea. At the same time there are no traces of that sea on the high plains of East Siberia, which were only intersected by several narrow elongated gulfs of the ocean. The moistness that thus ensued permitted glaciers (which are wanting now throughout the middle parts of East Siberia and Mongolia) freely to accumulate, so that the whole of the upper plateau and its border-ridges were under a mighty ice-cap. Immense glaciers, like those of the Alps and Jura, covered also the alpine regions. How far glaciation extended over the plateau of Tibet and in China still remains unsettled. In Turkestan and Siberia, immense accumulations of loess fringe the alpine regions; while in China they cover immense tracts, and are the most fertile regions of Asia.

Many important changes in the distribution of land and water have been going on in Asia since the Glacial period, and even during historical times. Since the Aral-Caspian sea became isolated from the ocean, its desiccation, as well as that of the numberless lakes which dotted the surface of Asia during the Lacustrine (Post-Glacial) period, has proceeded with a rapidity which may be guessed from the very rapid rate at which the process has been observed to go on in Siberia during the last hundred years. All Asia bears unmistakable traces of having been covered during the Lacustrine period with numberless large and small lakes, which have now disappeared, not in consequence of the action of man, but in consequence of some general causes affecting the Earth's surface since the last Glacial period. The process is still more accelerated by the rapid upheaval of the continent—the whole of the Arctic coast, as also most of that washed by the Pacific, the Mediterranean, the Red sea, and parts of the Indian ocean, being in a state of gradual elevation, while the few areas where traces of subsidence have been noticed are very limited. The influence of the desiccation of Asia has been felt even during historical times, and the migrations of the Ural-Altaians, Turks, and Mongols will probably be best explained if this change in the condition of Central Asia be taken into account; while the same circumstance explains the present nearly desert state of those regions which were the cradle of European civilization.

Volcanoes play an important part in Asia's geology; no less than

122 active volcanoes are already known in Asia, chiefly in the islands of South-East Asia, the Philippines, Japan, the Kuriles, and Kamchatka, as also in a few islands of the Bay of Bengal and Arabia, and of Western Asia. Numerous extinct volcanoes are found, not only in the same regions, but also in the Caucasus, on the plateau of Armenia, in East Tian-shan, in the north-western border-ridges of the high Siberian plateau, and in the south-west of Aigun, in Manchuria (the Uyun Holdontsi region). An immense zone of land was covered with basaltic lavas during the early Tertiary period (or Cretaceous?) along the north-western border of the high plateau of East Asia, and vents through which scoriæ were ejected, forming small cones of ejection, are still seen on the Mongolian and Vitim plateaux, as well as in the Sayans.

Earthquakes are frequent, especially in Armenia, Turkestan, and around Lake Baikal.

With the rich botanic materials which we are already in possession of, it would be extremely interesting to make a picture of the distribution of the different floras of Asia upon the surfaces of its high and lower plateaux, their border-ranges, the alpine zones, the high plains, and the lowlands. It would then appear how much these orographical divisions can help us to find out the true distribution of floras, which botanists have hitherto tried to bring into accordance with zones that were traced either along the degrees of latitude, or according to the basins of the different rivers, without taking into account the great orographical divisions and the differences of altitude, which mostly run in diagonal directions. Thus, to take only one example, the Great Khingan is the most important botanical boundary which is found all over Siberia and Manchuria. When one crosses this border-range and goes down its steep slope towards the east, one sees that in one hour, or maybe in half an hour, quite a new flora—Manchurian—takes the place of the Siberian flora; and one notices the appearance of trees, which strike even the most ignorant in botany, because these trees have not been seen before, while the traveller crossed Siberia over a distance of several thousand miles. One sees also how the Manchurian flora endeavours to spread westwards along the valleys of the Upper Amur and the Argun. Another important botanic boundary is the escarpment of the upper plateau, that is, the border-range of the Yablonovoi. This escarpment separates the Daurian flora from the Siberian, properly speaking, as sharply as the Great Khingan separates the Manchurian flora from the Daurian.

The Little Khingan will, I am inclined to think, also appear some day as another interesting botanic boundary between the Manchurian flora and the flora of the Pacific littoral. It is also quite certain that in Central Asia, in the Gobi, in India, and in Western Asia, one could arrive at most interesting botanical generalizations by

establishing the connection between the orographical and the botanical data; it is sufficient to mention here, as an instance, the delimitation of botanic regions in the Caucasus lately made by Russian botanists, who have shown that the Pontic range (that is, the border-range of the Armenian plateau) is an extremely important botanic boundary, or the remarks of M. Novitskiy concerning the flora of the Karakoram plateau.

The immense region which is usually represented on geo-botanic maps under the name of Eur-Asian boreal region, and which is bounded on the south by a line traced from the Black sea to Lake Baikal and thence to the Upper Amur and to the Sea of Okhotsk—this region has not the uniformity which one would be inclined to attribute to it by considering the map only. While it is quite certain that plants easily spread from west to east—from Russia to the lowlands of Western Siberia—they spread also with the same facility from the south-west to the north-east along the high plains, the alpine zone, the border-ranges, and the plateau itself. Consequently, the flora of Siberia itself can already be subdivided quite naturally into a number of distinct regions running south-west to north-east, and not west to east. Thus we see, for instance, the cedar-tree (*Pinus Cembra*) spreading along the highest parts of the north-western border-range of the high plateau, from the Altai to the Lena. We find again the same vegetation on the high plateau in North-Western Mongolia, round Lake Kosogol, and the Upper Vitim. The vegetation of the high plains of the Altai offers again a great analogy with the vegetation of the high plains in the west of Lake Baikal (the Minusinsk flora being an intermediate link between the two), and the Transbaikalian flora in the east of the Yablonovoi has very much in common with the flora of the Gobi.

As soon as the Amur emerges from the high plateau, in which it has excavated a deep valley, we find on its banks representatives of the Chinese and Japanese flora under the very same latitudes where we find the Siberian flora further west. And it appears from recent explorations that even round Lake Balkhash, and at the foot of the Tian-shan, vestiges of the European-Siberian flora have maintained themselves on the best-watered slopes. The lines of propagation of plants along the degrees of latitude are thus completed by lines of propagation having an oblique direction, from south-west to north-east.

The next zone which is marked on our botanical maps is the zone of the Steppes, which spreads from the prairies of South Russia through the Aral-Caspian depression and the middle parts of the high plateaux Western and Eastern Asia, including various separate desert regions (the Han-hai, the Gobi, the dry parts of Inner Arabia, of Persia, and of North-West India). However, this immense region ought to be subdivided, for Central Asia alone, into at least four distinct regions,

namely, the Aral-Caspian flora, the Tian-shan, the Tibet, and the Mongolian flora.

The flora of the regions situated on the east of the high plateau, including China, Manchuria, and Japan, must be considered as a counterpart of the Mediterranean flora. The oak reappears as soon as we cross the eastern border-ridge of the plateau, which is the Great Khingan; so also the walnut tree, the lime tree, the hazel, and the myrtle, while several new species of poplar, willow, acacias, and many others make their appearance. The forests, consisting of a very mixed vegetation, where southern species meet with northern ones, become really beautiful; while in Japan a variety of species of pine and the reappearance of the beech add to their beauty. A rich underwood of lianas, ivies, wild vines, roses, and so on, renders the forests quite impassable, especially in the littoral region, which is submitted to the influence of the monsoons. In the lower parts rich prairies cover immense spaces, the grass vegetation becomes luxuriant, and in the virgin prairies of the Amur man and horse are easily concealed by the grasses of gigantic size. Rice and cotton are cultivated in the southern part of the region. However, this region is too vast, and has too many different aspects, to be considered as one single region, and ought to be subdivided into three sections—the Chinese flora, that of Manchuria, and the Okhotsk littoral.

A striking change in the character of the vegetation is also seen, as we now learn from recent exploration, at the south-eastern extremity of the high plateau of Asia. The traveller who comes from Mongolia and has crossed the Kam region of Eastern Tibet finds, as soon as he has penetrated into the region of the tributaries of the Blue river and Mekong, quite a new world, both vegetable and animal. The very fact that the 12,000-feet-high plateau is deeply excavated by the valleys and canyons of the great rivers, and that this part of the plateau is submitted to the influence of the monsoons blowing from the south-west, is sufficient to give quite a new character to the vegetation, which may be described as a mixture of the Chinese and Indo-Chinese floras.

In the Caucasus the rich vegetation of the wet portions of the country, situated between the main chains of the Caucasus and the Pontic chain, belongs to the Mediterranean flora of Western Europe. As to the flora of Asia Minor, it combines the species of Southern Europe with those of North Africa, as we find there evergreen oaks, the laurel-olive tree, the myrtle, the oleander, the pistachio tree, and a great variety of bulbous plants.

These few remarks indicate how much the task of the geobotanist would be facilitated if he took into consideration the great features of the orography of Asia and the orientation of the main orographic divisions. The same must be said with regard to the fauna of Asia. It would be impossible to understand its distribution if we

did not take into consideration, as has been indicated by Syevertsoff, the spreading of many species from the south-west to the north-east along the plateaux and the plains. It may thus be said that the high plateau of Asia has its own fauna, so also its lower terrace, and also the lowlands of the deserts and those of the prairies.

V. Analogies of Structure between Asia and North America, and their Bearings upon Theories concerning the Origin of Mountains.

During a journey which I made across Canada, from the Gulf of St. Lawrence to Vancouver, in 1897, with the British Association, I was struck with certain analogies in the orographical structure of Asia and North America, which I laid down in an article contributed to the *Nineteenth Century* (November, 1897). I permit myself to reproduce here these remarks, slightly revised, as they will better confirm the ideas brought forward in the previous four chapters.

"As I was crossing Canada from east to west, travelling in succession through the woody regions of West Quebec and East Ontario, through the rocky and hilly mining region, situated in the north of the great lakes, over the vast prairies, and finally across the highlands and the plateaux of the Pacific border, I was simply amazed at finding such a resemblance between the geographical features of these successive regions and the features, once familiar to me, which I had met with in the Old World, in crossing Siberia from west to east in about the same latitude. The traveller who would land in Russia on the coast of the Baltic sea, and proceed eastwards through Northern Middle Russia, across the hilly and mining regions of the middle Urals, over the vast prairies and plains of Southern West Siberia, and finally across the highlands and the plateau in Eastern Siberia, would meet with exactly the same types of geographical regions, in the very same succession, as those which he meets with in crossing North America, under the 50th degree of latitude, but in the opposite direction.

"In the Eastern States of America, which would correspond under this view to Western Europe—both facing the Atlantic, and both representing the main seat of our present civilization—the analogy may be less apparent. But the woody tracts of Eastern Canada, which have been compared more than once to the woody tracts of Northern Middle Russia, are really the counterpart of that portion of Europe. Next come the hilly, rocky, and forest-clothed mining regions which rise in Canada in the north of Lake Superior, and they remind me in many respects of the Urals, which, by the way, are *not* the narrow worm-like chain of mountains that is traced on our small-scale maps, but represent a wide expansion of ravinated plateaux of a moderate height, and chains of hills, dotted with gold, copper, and iron mines. They also have in the south a great interior sea, the Caspian.

"Proceeding further westwards through Canada, we entered, all of a sudden at Winnipeg, on the boundless low prairies of Manitoba; and here the illusion was complete. I might as well believe myself entering the low 'black-earth' prairies of South Tobolsk, at the foot of the Urals. Same general aspect, same soil, same desiccating lakes, same character of climate, same position with regard to the highlands, and, very probably, same lacustrine origin in both cases.

"Further on, as the train rolled westwards, and, after having gently climbed

over an escarpment, crossed the higher sub-arid 'rolling prairie'—we should call it steppe in Siberia—I could easily imagine myself amidst the 'high plains' which the Siberian railway enters beyond Tomsk. The altitude of these steppes in the two continents, the escarpments which separate them from the lower terrace, the general aspect of both the surface and the vegetation, all these are wonderfully similar; while the small East Siberian towns of Kainsk, Achinsk, and Krasnoyarsk could be described as sister-growths to Medicine Hat, Calgary, and Regina, were it not for the Americanized aspects of the Canadian towns. The 'barren lands' in the far north of Canada, which are similar in all respects to the sub-tundras and tundras of Siberia, and the deserts of the American plateau in the south, which correspond to the deserts of Mongolia, complete the analogy.

"Finally comes the belt of parallel mountain ranges—the Rocky mountains, the Selkirks, the Golden range, and the Coast range, with elevated plateaux lodged between them; and here again the analogy with the East Asian plateau and the parallel ranges of mountains which rise above its surface is nearly complete. The Siberian highlands are wider in the same latitude, and the stretches of high plateaux are broader than in Canada; but the similarity of the general aspect is such that, for instance, at Okanagan I really felt as if I were amidst the Transbaikalian steppes (the lower terrace of the plateau), although the American ranges —namely, the Rocky mountains—are of a more recent origin than the mountains bordering the plateau of Eastern Siberia. Same altitude of the plateau, same dry climate, same general aspect, same surface-structure, and same character of erosion in geologically recent periods.

"Fortuitous coincidences would not do to explain such a similarity of structure. It was known long since that there are certain analogies in the main outlines of the two great continental masses situated in the western and the eastern hemispheres. It now appears that the analogies in the surface-structure—in the orography—of North America and Eurasia are even more striking than the resemblances in their outlines. In fact, the dominant feature in the structure of North America is an elongated belt of highlands—plateaus and parallel mountain ranges—which runs in a north-western direction from Mexico to Alaska, gradually decreasing in height and in width as it enters higher latitudes. The Rocky mountains fringe it along its eastern border, and at the foot of these mountains stretches an immense continental plain, divided into two, or rather three, distinct terraces, which fills up the angular space between the great plateau and the Appalachian system of parallel chains.

"The same structure is found in Asia. Only Asia and America are, so to say, the positive and the negative of each other—the right hand and the left hand. In Asia, too, a huge upheaval, made up of plateaux and highlands, diminishing in height and width as it enters higher latitudes, stretches from the Himalayas to the Tchuktchi peninsula, to meet by its narrow end the narrow end of the American plateau. This backbone of Asia occupies, however, the eastern portion of the continent instead of the western portion, and it runs north-eastwards instead of north-westwards. It appears, so to say, as the negative of the former. A girdle of high mountains, intersected by gigantic trenches (Tian-shan, Altai, Sayan, etc.), fringes the plateau along its continental border, thus corresponding to the Rocky mountains; and an immense continental plain, also disposed in two or three distinct terraces, occupies the wide angular space between the great plateau and another succession of highlands which run through Persia, Caucasia, Asia Minor, and the Balkan peninsula. The main lines of orographic structure are thus remarkably analogous. Regions of similar structure succeed each other in the same order, but in an opposite sense.

"One difference must, however, be noted. In America, the highlands reach directly the coasts of the Pacific ocean; there are no plains between the plateau and the coast; while in Asia we have, in the Amur region, Manchuria, and Lower China, a wide expansion of plains and lowlands (intersected by several parallel chains of mountains) which spreads between the border of the plateau and the coast of the Pacific. It is only in a higher latitude, on the coast of the Sea of Okhotsk, that the plateau faces directly the great ocean as it faces it at Vancouver. The mountain-building activity to which both the rows of islands bordering the Pacific coast of America and the coast-ranges in Asia are due, must have been greater in Middle Asia, or having began at an earlier date, it has added to the Asiatic continent the plains and the very young lowlands of the Lower Sungari and the Lower Amur, a counterpart of which we do not find in America. It must be remembered, however, that perfect similitude is never found in Nature. Analogies are all that we may expect to discover.

"The Pacific ocean thus appears encircled on both sides by two huge masses of plateaux, which assume in their outlines, and in the disposition of their outward slopes, very much the same character. These two continents are very ancient, and in Asia it dates from the earliest portions of the Primary epoch. The gradual growth of these two continents proceeded chiefly on their outward slopes, so as to produce a repetition, in the same order, of the same geographical features.

"We must consequently infer that our globe is not an incoherent mass of plateaus, mountains, and plains, patched together in a haphazard way. Some force, quite general in its character, and consequently telluric, if not cosmic—a force which acted at an angle to the present axis of rotation of the Earth—has directed the growth of the mainland masses in the Old and the New World. For ages it has acted symmetrically on both sides of the two chief plateaux of the globe; and through all vicissitudes of local contractions, upheavals, and depressions, it has resulted in producing a remarkably symmetric structure on the two sides of the abysses of the Pacific ocean."

The geographer, on seeing these analogies, is naturally inclined to discover how his orographic conceptions can be brought into accordance with the modern theories concerning the origin of mountains and continents. Consequently, I will add a few words on this important subject.

It is known that James Dana, in the successive editions of his 'Manual of Geology' (4th edition in 1896), has worked out a very complete theory of the origin of mountains. According to this theory, the chains of mountains are formed in consequence of an unequal cooling of the superficial layers of the earth at the bottom of the oceans and along their coasts. This difference results in an oblique thrust from below upwards, directed from the ocean towards the continent all along the coasts, and especially in those places where the sinking of the bottom of the ocean goes on more rapidly under the weight of accumulated sediments.

The greatest changes of level of the mainland must consequently be produced in a zone of from 300 to 1000 miles wide along the coasts. Here we shall find the greatest upheavals, as also the greatest foldings and fractures of the rocks; and as these changes of position of the rocks

are transformed into heat, it will also be in this zone that we shall find the greatest effects of metamorphism. This is why the chief lines of volcanoes are always situated along the oceanic coasts, and why (I shall add) we see border-ranges along the fringes of the plateaux, which were sea-coasts during the previous geological periods. This feature is found not only in the present distribution of volcanoes, but, as Dana shows for America (and, as appears from the preceding, is true also for Asia), it was also noticeable during the preceding geological periods, namely, the Tertiary in the case of the high plateaux of Asia. The consequence of this activity is that new lines of parallel foldings must appear in the shape of chains of mountains all along the coasts of a continent. The continent invades the ocean, and at the same time the depths of the oceanic abysses increase along the rocky coasts of a continent.

If the theory of Dana is approximately correct, then the gradual growth of the Asiatic continent, as well as its present shape, can be very well explained. During the Primary epoch, Asia consisted only of the high plateau, which had the shape of a South America, directed by its narrow point towards the Behring strait. (Was not the North Pole in that direction at that time?) On the line of division between what was then the continent and the oceans which surrounded it at that time, in consequence of the oblique thrust of which Dana speaks, the border-ranges must have been formed all along the fringe of the high plateaux, while a succession of parallel mountain ranges, resulting from as many foldings of the strata, were formed round the continent, just as the islands of Formosa, Japan, and so on, are now lifted all round the continent of Asia in a series of curves indicated by Suess. Later on, when the lower Mongolian terrace of the plateau emerged in its turn from the ocean, the formation of mountains was continued along its borders. It was then that, in all probability, the border-ranges of the second terrace (Great Khingan, etc.) and the alpine zone which fringes these border-ranges were formed.

A similar formation is also found, but on a much smaller scale, along the fringe of the third terrace—the terrace of the high plains; but the arrest of upheavals was not sufficiently long at this stage, nor was the difference of level between the high plains and the bottom of the ocean sufficiently large to generate the high border-ranges such as we find along the fringes of the plateau. And finally, during the recent periods, a series of littoral chains has been lifted up, and is being lifted up still, all along the present coasts of the Pacific ocean. That these chains are not generated in straight lines, but have a crescent shape, as has been suggested by Suess, is pretty correct, and it must also be remarked that the border-ranges of the plateau also are not quite straight lines. We see, on the contrary, that straight lines are intermingled with crescents, and when I speak of chains of mountains having a direction from the south-west to the north-east, or

from south-east to north-west, I only mean that such is the general direction of the chain, without pretending to say that the chain follows necessarily a straight line. Sometimes the line is nearly straight, or it follows a great circle of our globe; this last case is very frequent, but sometimes it also has the shape of a curve. It thus appears that the theory of Dana, completed by the study of erosions which took place during an extremely long succession of ages on a grand scale, and the generalizations concerning the orography of Asia, which are expounded here, stand sufficiently in accordance for mutually confirming each other.

VI. The Bearing of Modern Research upon the Views expressed in the Above Sketch.

The views expressed in the above sketch have been confirmed by modern research in several important points. Thus, I must say that I felt great hesitation in tracing the Little Khingan (Bureya range, which was then known only to the north of the Amur), in the position I gave it on my map, pierced twice by the Sungari, and joining at its northern extremity the Shantar islands. Such a position of this chain of mountains implied the necessity of representing the mountains of Southern Manchuria, too, as running south-west to north-east, so as to be pierced by the Usuri in an oblique direction (while all the Russian maps placed them parallel to the Usuri on both banks of this river), and reaching the Pacific coast also in an oblique direction. In fact, I should have preferred at that time any other hypothesis, if I only saw its possibility. If I finally accepted this one, it was only because I could explain in no other way the character of the banks of the Sungari and the Usuri, which I knew more or less from my journeys of 1864 and 1866, and that this agreed best with the general character of the region, such as I understood it. The researches of the last few years have, however, confirmed the views I had taken then. In the Shantar islands, judging from their geological structure, Bogdanovich has really recognized a continuation of the Little Khingan; and the researches of the Manchurian expedition of Anert have confirmed in the main the directions which I had given hypothetically to the Little Khingan in the basin of the Sungari, as also to the South Manchurian chains of mountains. As to the Usuri, Eduard Suess, who has utilized all modern explorations, including those of Ivanoff, fully confirms that this river pierces the mountains in an oblique direction.*

* He writes, himself underlining this passage:—"*However, the valley of the Usuri is not a longitudinal valley.* Between the latitudes 47° and 46°, where its direction is nearly meridional, this is seen perfectly well. When one has passed, on one's way southwards, the Samur mountain, which consists of eruptive rocks, one reaches the quartzite

The difficulties which I met in 1875, in determining the position of the north-western border-range in the Sayans, have been mentioned (§ 5). All I could say then, on the basis of Kryzhin's survey and a few other hints, was that the country in the south of the East Sayans (North-Western Mongolia) must be a high plateau. This has been fully confirmed since, as may be seen from the little hypsometrical map of north-western Mongolia given on p. 340 (Fig. 7), which I have made on the basis of the map of Potanin and the subsequent measurements of altitudes. As to the East Sayan, it now appears, from the researches made in connection with the Trans-Siberian railway, and summed up by Eduard Suess, that in their western portion these mountains represent a border-range which runs east-south-east to west-north-west. The punctuated line in Fig. 4 (p. 188) thus seems to be a real border-range. The fringe of the plateau would be composed in this case (just as we see it in the terraces of Northern Tibet) of two border-ranges meeting at a nearly right angle.*

As to the Western Sayan, it appears from Suess (l.c., pp. 98–105), who has utilized all the latest Russian explorations, that it really is (as I supposed it to be) a border-range which runs west-south-west to east-north-east, or south-west to north-east, and has at its foot, in the Minusinsk plains, horizontal layers of Devonian deposits; while to the west of the Yenisei the difficulties which I met with in ascertaining the leading orographic features of that region † are now removed by the

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hills of Zifaku, which run north-eastwards, forming the Tiger mountains, and thus passing from the valley of the Usuri into that of the Lower Bikin, and cutting the Usuri in an oblique direction" ('Antlitz der Erde,' iii., 1, p. 174). The French edition of the same work of Suess, 'La Face de la Terre,' contains (p. 173) a schematic map of the Sikhota-alin, reduced from Ivanoff's map in the Russian 'Railway Explorations' (xvi., 1898). It confirms entirely my views both as regards the Little Khingan and the Sikhota-alin, and thus relieves the doubts which worried me since 1875.

* "In fact," we read in Suess's admirable work, "one finds out that the Eastern Sayan has its independent continuation beyond the 69th degree of longitude, in the same north-western direction. On its continuation we find, for instance, according to Idjitzki, an altitude of 2393 metres (7300 feet) on the pass between the Kana and the Agul, while several snow-clad peaks on the Upper Kana rise above 6000 feet. It is continued as a mountain range of considerable width towards the Mana, and is pierced by the Yenisei just to the south of Krasnoyarsk, making on the other bank of this river the Gremyachinsk hills, and it appears under the younger deposits of the plain, without reaching, however, the main road at Achinsk" ('Das Antlitz der Erde,' iii., 2, p. 86).

† "Orographical Sketch of the Region of Minusinsk," etc., in *Memoirs of the Russian Geogr. Soc.*, General Geography, vol. v., 1876, with hypsometric map. I found it difficult then to explain the structure of the mountains in the west of the Yenisei as a series of foldings running south-west to north-east. My brother Alexander, who was exiled to Minusinsk, also wrote to me while I was at Clairvaux, that, according to the explorations of subsequent explorers, the mountains in that region seemed not to have, all of them, that north-eastern direction. It appears now that there are there upheavals running south-east to north-west—probably continuations of the portion of the border-range which has that direction.

discovery of the fact that there are in that region upheavals in the north-western direction, just as we have them in Turkestan.

The Sailughem range of the Altai, which I consider as part of the north-western border-range of the high plateau, has been for me, for the last twenty years, a standing subject of doubt. Now, the last explorations of Kozloff, Ladyghin, and Kaznakoff, seem to give a strong support to the border-range hypothesis. North-Western Mongolia is indeed a high plateau, from 3000 to 4000 feet of altitude, upon which the 3000-feet contour line encircles but a small area, dotted with lakes and remains of still larger old lakes (Fig. 7). The Sailughem range, so far as may be judged from the last Kozloff expedition and Adrianoff's journey, *is* the north-western border-range of this plateau. It slopes gently towards the high plateau of Mongolia, and falls with a very steep slope towards the valleys of the Altai. It thus seems to be a real continuation of the Western Sayan, of which it apparently retains the north-east to south-west direction.* As to the Ektag Altai, which crosses the Sailughem at nearly a right angle, and runs west-north-west to east-south-east, numerous recent expeditions have distinctly proved that it has the perfectly distinct characters of a border-range which faces the Jungarian depression by a high and steep escarpment, but gently slopes to the plateau of North-Western Mongolia. And finally, it appears now more and more that the Khangai is either a "superposed range" (K. Ritter's *angehäufte Gebirge*) which has its foot on the surface of the plateau, or, what I believe to be more probable, the escarpment of a slightly higher terrace—the Kosogol terrace. Moreover, I am very

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* Adrianoff (*Zapiski* Russ. Geogr. Soc., "General Geography," vol. xi., 1888) went from Tomsk, past Lake Teletskoye, up the Chulyshman and the Balkhaus, and across the Uvelu-art pass. So long as he journeyed in the drainage areas of these two rivers of the Altai, he recorded in his diary all the features of a typical Alpine region. But once he had reached the top of the Uvelu-art pass, he found a complete change of scenery. The pass was not a "saddle" at the head of two valleys, but it led (as is usually the case in the East Sayans and the south Muya border-ranges) across the top of a dome-shaped mountain, "quite smooth, like a deal floor." From this top an immense panorama was opened before him, and beyond the pass the character of the country was entirely changed. The south-eastern slope of the pass was very short, and its foot was only 600 feet below the top of the pass. "We have before us," Adrianoff wrote in his diary, "a true Mongolian steppe" (at an altitude of nearly 4500 feet), "treeless, and covered with the usual shingle," with flat marshy depressions, and bottoms of old lakes. "The rivers flow *on* the plateau," he continues, "and the water-partings between them are flat and marshy." The Shapshal mountains between Lake Ubsa-nor and the Yenisei (Kemchik) rise less than 1000 feet above the level of the plateau (Karandu-Kobi pass), and at the northern foot of these hills Adrianoff was again on the same level of nearly 4500 feet as before; while from the top of the pass he saw before him "an immense panorama of a wide steppe," "grey-coloured, and fatiguing by its monotony." Only, when he had reached the Kemchik (Yenisei), he was once more in a valley, deeply excavated in this massive upheaval. Adrianoff's description thus settles all doubts about the border-range character of the Sailughem range.

much inclined to believe that both the Khangai and the Ektag Altai join the Kentei, which is the south-eastern fringe of the North-West Mongolia terrace and a direct continuation of the Yablonovoi border-range. These four ranges would thus limit the upper Mongolian terrace, just as the border-ranges of Northern Tibet, which run in the same two directions, fringe the still higher Tibet terraces, or as Bohemia represents in Europe on a small scale the same mountain-fringed parallelogram structure, with the same orientation of the fringes.

As to the non-existence of an uninterrupted mountain range, the Stanovoi, which was supposed to separate the tributaries of the Pacific from those of the Arctic ocean, the journeys of Joseph Martin, in 1883 and 1884, and of the mining engineers, Gerasimoff and Ivanoff, in connection with the Siberian railway, which Suess sums up in his elaborate work (pp. 144–152), fully confirm this suggestion, and the great Austrian geographer concludes his inquiry into this matter by saying, "Kropotkin has on the whole judged correctly . . . the line Stanovoi-Yablonovoi has to disappear from our maps" (p. 152).

Another very important but doubtful point seems also to find support in modern research. When I represented Lake Baikal not as a longitudinal valley, but as a succession of two or three longitudinal lakes, connected by transverse cuttings, which meant that the mountain ranges of the western shore of the lake would be continued on the eastern shore—crossing the lake in an oblique direction—I ventured, of course, a rather bold hypothesis, which I could base only upon what we knew of the geology of Lake Baikal from Meglitzky (1851), and upon the general, most characteristic orography of this region. Consequently, I hesitated very much before I ventured to give such an extraordinary representation of the orography of this region. However, the geological map of the shores of Lake Baikal, which was since made by Chersky (Czerski), fully confirms this hypothesis. It shows that the northern portion of the lake is indeed an oblique transverse rent, and that the mountains of the western shore are continued on the eastern shore. Erosion, probably aided by local subsidences, has evidently worked in the long succession of ages to further modify the primitive features. The excellent and still more detailed geological researches of Obrucheff have further still confirmed the same view, and Suess, after having analysed the whole question, expresses himself as follows:—

"The ranges of gneiss, old slates, and crystalline limestones show the existence in this place of two anticlinals and two synclinals which run east-north-east across the lake. They cross the Maloye More under a sharp angle, and reach the east coast in the Svyatoi Nos and south of it, just in the sense of Kropotkin's conception" ('Antlitz der Erde,' iii., 1, p. 81).

The map of Lake Baikal, after Chersky and Drizhenko, reproduced on p. 194, illustrates these words of Suess. Moreover, we owe to

Chersky the quite correct suggestion concerning the importance of erosion in modifying the primary features of the orography of Siberia, —a factor the importance of which I did not discuss in my "Sketch," and which I certainly underrated at that time. Not only are the "trenches" which lead from Lake Baikal to the surface of the plateau obviously due to this cause, but also the deep valley of the Irkut, which I described as a longitudinal valley at the foot of the border-range, owes its origin, as Chersky has proved, to a great extent to erosion. It is almost certain, too, that erosion has mightily contributed to the formation, or, at least, to the widening and deepening, of the great Jungarian trench, as also to the formation of the Lukchun depression. With regard to the latter, it must, however, be remarked that, maybe, the tectonic causes indicated by Suess, or, maybe, as I am inclined to think, the causes which, according to Dana, are at work in the building of the mountains along the oceanic coasts, have contributed to the formation of those interesting deep depressions that are found along the northern border-range of the plateau, which was at the close of the Primary epoch a coast-range of the then continent of Asia.

And finally, it must be mentioned that all modern research, of which such an able review has been given by Suess in his volume devoted to Asia, confirms the idea which was suggested to me by the study of Siberia alone, namely, that the High Plateau of East Asia, its lower as well as its higher terrace—with the exception of its Himalayan fringe, a Carboniferous gulf at its junction with the Pamirs—have not been under the sea since the Primary period: Devonian for the lower terrace, and probably Carboniferous on the outskirts; while the Lowlands, and even the High Plains of both the Arctic and the Pacific slope, were undoubtedly covered by Mesozoic and partially by Tertiary seas.

As regards the curvilinear chains of mountains to which Suess attributes so great an importance in the orography of Asia, I will only permit myself one remark. Leaving aside the curved shape which even a straight line traced on the surface of the globe (a great circle, a meridian, or a circle of latitude) takes when it is traced on a map drawn in our usual projections, it is very probable that some of the curves which are traced on Suess's map of Asia, in his last volume (iii., 1), will be resolved into chains running in two directions, south-west to north-east, and west-north-west to east-south-east. In such complicated highlands as the Tian-shan, the chains of mountains are still traced on our maps quite hypothetically, in the shape of sinuous lines following the water-partings between the rivers. The same is true of vast portions of Asia. However, every cartographer who has followed the progress of cartography in Asia will probably agree that progress has consisted for the last twenty years in wiping out the curvilinear chains of mountains, and in tracing, instead, mountain ranges which run north-west

and north-east respectively. An example of such a dissolution of curvilinear chains into two chains running north-west and north-east is given by Suess himself in the formerly curvilinear Erghik-targak-taiga, which he, in conformity with recent surveys, resolves into the Western Sayan range (which runs north-east) and Eastern Sayan (which runs north-west). The curvilinear old Mustagh and Karakoram mountains; the eastern curves of the so-called Kuen-lun, which had been traced by Richthofen, and which now have disappeared from modern maps (see my article "Kuen-lun" in the Supplement to the 9th edition of the 'Encyclopædia Britannica'); the great curvilinear Tian-shan that was traced in the sixties from Kashgar to Karashar—all these, compared with the network of mountains running north-west and north-east which one now sees on the admirable map of Inner Asia in Stieler's Hand-atlas (No. 62) just published, are illustrations of the same tendency. The modern surveys wipe out the great curves, and they trace chains which run, broadly speaking, south-west to north-east and west-north-west to east-south-east respectively. Of course, these lines are not strictly straight lines—straight lines are rare in Nature—they are mainly arcs, and in this sense Suess is perfectly right; but even the arcs take one of these two chief directions; and the former, *i.e.* the north-eastern in East Asia, as had been indicated by Mushketoff for the Tian-shan system, is the oldest.

These two lines of upheavals, I may add, are the leading feature of the orography, not only of Asia, but also of Europe, as I have tried to show in a paper read before the British Association in 1897, at Toronto (*British Association Reports*, Toronto Meeting, 1897).

VII. Maps, etc., accompanying this Paper.

1. *Orographical Map of Eastern Siberia and Parts of Mongolia and Manchuria.*—This map is a revised reproduction of the original Russian map which accompanied my "Sketch of Orography of Eastern Siberia" in the *Memoirs of the Russian Geographical Society*, General Geography, vol. v., 1875. It has been extended southwards, especially south-westwards, in Mongolia, where I was enabled to utilize the results of the Russian surveys in north-western Mongolia, which show so well the high-plateau character of the region and the border-range character of the Mongolian Altai. I have also revised the Alpine region of the Nijneudinsk district and the Eastern Sayans. It appears more and more probable, from the recent Russian surveys, that in order to reach the upper Mongolian plateau from the valleys of the Siberian rivers, one has to cross a border-range. But whether there is a continuous border-range, as I have marked now on the revised map (following the suggestions given by the modern Russian maps), or whether there are only prolongations of the plateau running towards the north-east, as I

had marked on my original map in 1875, remains, in my opinion, as unsettled as it was thirty years ago. I will only recall that when I went from the Okinsky Karaul towards the west-south-west, up the valley of the Junbulak, covered with a mighty stream of lava and leading to the small volcanic cones of scories at the head of the Junbulak, near the Chinese frontier, I met with no border-ridge, but gradually reached the altitude of 7000 feet, always following this valley. I saw, on the contrary, a beautiful rocky and dreary range of mountains rising over the bottom of the Okinsk expansion of the Oka valley and running *north-east*. I crossed this range and two more ranges parallel to it, but lower, as I went from the Okinsky Karaul to Ziminskoye, on the Siberian highway. Consequently, in accordance with modern Russian maps, which seem to be quite reliable (Stieler's Atlas also follows them), I have traced a border-ridge running north-west to south-east, and I have traced in the Nijneudinsk district a series of foldings running in the same direction; but beginning with the Oka and further eastwards, I have left the mountain ranges running north-east, as I saw and mapped them. In what relation the two systems stand to each other remains still a puzzle.*

A few corrections have been made also in the North Yeniseisk mountain region, in accordance with some new surveys. The river-net in the basin of the Zeya has been drawn anew, in accordance with the latest surveys, and I can only indicate how much better the river-net agrees now with the directions which I had given (hypothetically) to the mountains. Similar slight changes have been introduced in Southern Manchuria and Southern Mongolia, so far as they are included by the map.

2. *Orographical Map of Asia.*—This map is meant to illustrate my ideas about the orography of Asia as a whole. The foundation for this map was taken from the map of Asia in Stieler's Hand-Atlas.

3. *Cross-sections.*—These are approximately correct data, documents without any theory or hypothesis to arrange them, and they speak distinctly enough in support of the ideas advocated in this paper. One of them (KLMN) shows the character of the high plateau over a considerable portion of its length, and the other (ABCD) has been so chosen as to pass through regions for which we have more data, and which better illustrate the different orographical types of East Asia. All the altitudes have been taken from the 'Catalogue of Altitudes in

* May I impress upon the Russian Geographical Society, and its East-Siberian branch, that they would render a real service to geography if they should send out for a couple of years two light expeditions, each consisting of a geologist armed with a barometer, and a topographer, to explore the orography and, so far as possible, the geological structure of these regions (the mountains on the upper Uda, the Kan, the Iya and the Oka), as well as to cross in two or three places the Tunka and the Kitoi Alps.

Eastern Siberia,' which I had compiled and published in 1873, and which has now been embodied in the extended Catalogue of Dr. Hickisch. Several more cross-sections will be found in my "Report of the Olekma and Vitim Expedition," in vol. iii. of the *Memoirs of the Russian Geographical Society*, General Geography, 1873.

TIBET.

I. NOTES FROM TIBET.

By DOUGLAS W. FRESHFIELD.

Lord Curzon has recently forwarded to the Royal Geographical Society a set of thirteen photographs taken by Mr. Hayden, the geologist attached to the Tibetan Mission during its stay at Khamba Jong last summer.

These views have a double importance. In the first place, they illustrate the account given by Sir Joseph Hooker and other travellers of the rolling uplands that extend from the top of the long staircase leading from the plains of India up into Tibet. We have brought before our eyes extensive, almost level plains, treeless and clad only in parts with sparse herbage, girt and divided from one another by low ridges, off which the rough angles have been rounded by ice. In the absence of definite valleys, sluggish streams meander aimlessly across the wide landscape. Dotted here and there on the vantage ground of some hillock are villages, often overlooked by the high white walls—pierced with a crowd of tiny windows and crowned by fluttering prayer-flags—of monastic fortresses. It is an open country. To compare small things with great, it bears the same relation to Sikhim that the plateau of Constantine does to the coastward hills and glens of the Kabyles, in Algeria, or the uplands of Armenia do to the valleys of Georgia. The horizontal prevails over the vertical in all the main lines of its landscape.

But for the geographer and the mountaineer the chief interest of these photographs lies in the fact that by combining them we can obtain a complete panorama from a novel point of view of the great groups capped by Kangchenjunga and the peak known to the Survey as XV., or Mount Everest, and to Tibetans as Chomokankar. All along the southern horizon beyond the low ridges of the foreground the brown landscape has a silver edging. Kangchenjunga is conspicuous; the round tower of Jannu is just recognizable; then come the to me familiar summits that encircle Lhonak. Beyond these, unknown but minor peaks stretch westwards to a broad break in the snows—the Arun valley. Further west Chomokankar shows its unmistakable outline. Again, somewhat north-west of Chomokankar appears a great group of

peaks; one rock and one snowy summit are conspicuous. These are apparently as yet unidentified and unmeasured. They rise at no great distance beyond Chomokankar, and are probably south of the Tingri Maidan. The two "very high snowy mountains," marked on some survey maps north of the Arun and the Tingri plain, do not, I think, come into any of these photographs. They are probably included on the right in the plate opposite p. 124 of vol. ii. of Hooker's 'Himalayan Journals.' Hooker gives the bearing from Bhomtso (near the Kangra La) of their highest peak (vol. ii. p. 169) as N. 55° W.

I have with some difficulty, and the help of a magnifying glass, roughly combined the different distant views. Unfortunately, they were not taken from a single standpoint. It is to be hoped that the surveyors with the expedition have supplemented them by obtaining with a phototheodolite, similar to that employed with such excellent results by Mr. Stein, panoramas of the Tibetan and Nepalese ranges.

The series of photographs sent home includes two near views of Chomiomo (22,385 feet) and Kangchenjhau (22,550 feet), the guardians of the Lachen valley passes, and a landscape showing what is called "the south," but obviously is the north-west, side of the Chortenima La. Members of the Mission seem to have been able to make excursions to a certain distance in this direction on the track followed some years before by Major O'Connor.*

In the *Geographical Journal* for January last I mentioned that Captain Wood, of the Indian Survey, had received permission from the Nepal Durbar to visit Katmandu for the purpose of ascertaining whether the 29,002-feet peak, known to the Survey as "Mount Everest," was visible from the heights near the capital, and also what range or peak is there known as Gaurisankar. I wrote, "It will probably be found that the great peak, if visible at all, is far from conspicuous, and only recognizable—like the Finsteraarhorn from Grindelwald—to those who know where to look for it."

Writing from Calcutta on January 13, the Viceroy has, in anticipation of a more detailed Report, kindly informed me of the results of Captain Wood's mission.

Lord Curzon writes, "Everest from Kaulia is an insignificant point, just visible in a gap in the main range." "The name Gaurisankar," he adds, "is given by the officials of Katmandu to Survey Peak XX. The name is not known to any of the Nepalese hill men." Peak XX. is 36 miles from the highest peak, Peak XV., but forms part of what, according to the principle adopted by European orographers, would be considered the same group. Peak XV. is 108, Peak XX. about 78 miles distant from Katmandu. The former peak is not visible from the city of Katmandu, and has no individual name on this side. It

* See 'Routes in Sikhim.'

THE NEPALESE HIMALAYA, FROM NEAR KHAMBAJONG.

(From a photo by H. H. Hayden.)

was, as I suspected,* wrongly identified by Dr. Boeck. The peak he took for it is one of the Jibjibia peaks of H. Schlagintweit's panorama from Kaulia (as can easily be seen by comparing the panorama with Dr. Boeck's photograph). The peaks were identified, whether correctly or not I cannot say, by H. Schlagintweit with Peaks XXII. and XXIV. of the Survey. It seems, therefore, that while, according to Alpine usage and precedent, there is nothing to prevent the name Gaurisankar being applied to the loftiest peak of the group, the lower summit of which, visible from Katmandu, bears that name, the Tibetan name Chomokankar is preferable.

I hope to return to this subject when the full Report, which I trust will be illustrated by telephotographic views, is to hand.†

Under date January 14, Babu Sarat Chandra Das writes to me, "I have read with the greatest interest your book of travels, and I am convinced of the correctness of your finding that my Chatang La is not the same with your Jonsong La. Chatang La is to the west of Jonsong La peak. I now remember what my guide told me then, that the Treasure of the Gods lay hidden beyond the La situated to my right-hand side while I was ascending the height of the Chatang La." This seems to indicate that the Chatang La corresponds with one of the gaps seen and photographed by my party at the extreme head of Lhonak, west-north-west of the Jonsong peak.

The *Bluebook* on Tibet recently issued contains many passages of geographical interest; they are to be found chiefly in the Reports from Mr. White, the Political Officer in Sikhim concerning the tour of the frontier he was instructed to make in 1902, and in those of members of the Mission quartered at Khambajong during the summer of 1903.

The following extract is from Mr. White's Report of his tour in 1902. After describing how his coolies broke down in the Tista valley, and how he cleared the Tibetans out of their post at Giagong, he gives a description of the region about the sources of the Tista.

> Early in July the whole of the territory between the Giaogong boundary and the boundary laid down by the Convention of 1890 was explored by me and mapped out, and I traversed the whole of the boundary going along the crest of the hills from the north of Chomiomo to the north of Powhunri at heights varying from 19,300 to 21,200 feet.
>
> The character of the tract of country is Tibetan. The climate is dry, cold, and bracing; hardly any rain falls; the valleys are broad and flat, and the hills are more rounded and worn than those to the south in Sikhim. During the day there is always a high wind blowing from the south up the valleys, which is very trying. Vegetation is scant; only a very little grass and in many places not even that, but what there is is very nourishing. The climate is very changeable—at one moment burning sun, and the next a snow-storm accompanied by a bitterly cold wind.

* See 'Round Kangchenjunga,' p. 200.

† In one of the last maps sent from the survey office at Calcutta to the R.G.S. Map-room, the height of Peak XV. is reduced by 8 feet, from 29,002 to 28,994.

To the north of the great snows the formation of the hills changes. In place of the universal gneiss, the hills to the west are composed of red or red-brown shale, which appears to have minerals in it and to be of volcanic origin; to the north, of shaley slate of a blue-grey colour; and to the east, what might have been at one time a sea-shore, though I could find no shells in it, and of soft sandstone loosely cemented together.

From the hills to the north some very fine views of Tibet were obtained, and many places, such as Tinki Jong, Kamba Jong, etc., I have been able to fix by triangulation.

On the 17th I crossed the Nangua-la with 120 laden yaks, 30 laden mules, 125 coolies, and one laden pony. Very light loads were given, and the journey was accomplished without any accident, although the pass, particularly on the east, is very precipitous.

I proceeded first up the Naku Chu to the Naku-la. Near the top of the pass, on one side, I found the usual Tibetan wall, rather better built than is customary, running across the valley with a block-house on the east, and some smaller block-houses on a ridge coming down from the east. The top of the pass is long, flat, and swampy, with several lakes. On the way up some very large mineral springs were met with, and sample bottles of each have been sent down to the chemical examiner for analysis. This water contains sulphuretted hydrogen, and apparently contains sulphur and iron in large quantities. These springs were forming large deposits.

As the survey of the Naku Chu was finished, I removed camp to the Langpo Chu, and went up that valley as far as it was possible, visiting the only pass into Tibet, the Chorten Nima-la. This pass is practically impassable for any transport except coolies, and difficult for them. The summit of the pass on the south is a long, very difficult, scree of loose stones, and to the north a very steep snow-slope ending in a glacier. The top of the pass is surmounted by several pinnacles of rock, which look as though they might fall at any moment, and are very characteristic. Of all the passes into Tibet, along the whole frontier, this is the only one with any pretence to fine scenery, and is very grand. The cliffs on each side run up to over 2000 feet, and are almost perpendicular. The elevation of the pass is 18,654 feet.

On exploring the head of the Langpo valley, I found it completely blocked by glaciers, some of very large extent. One glacier in particular is worthy of notice, as its formation is most unusual, consisting of ice-pinnacles over 100 feet in height, and of every shape imaginable. They were interspersed by pale blue lakes which gave a wonderful effect.

In this valley the survey was much retarded by the mist, which swept up from the south over the Kangchenjunga range and obscured the high snow-peaks all round, and it was only very early in the morning that any readings could be taken.

These valleys are quite unlike those to the north of Giaogong. They are bounded on the north by an impregnable, almost perpendicular wall of rock and snow, and the only outlets to Tibet are the Naku-la, an easy pass, and the Chorten Nima-la, which is practically impassable and never used. There is also a little more rain here than in the Cholamo valley, and the wind is not quite so strong.

There were 2615 sheep and 858 yaks grazing in these two valleys, but there is room for thousands more sheep, as many of the downs (ancient moraines) over which I went had excellent grass on them quite untouched.

At present the only route from Sikhim is over the Nangua-la, which is closed by the first fall of snow, and in order to make the occupation of the valley

effective, a road must be made up the Lonok Chu. This route is impassable at present owing to cliffs running into the river, which is unfordable, but I have asked for funds to construct a road, and hope to put it in hand before long.

Escort.—The escort did very well, and had hardly any illness during the whole time. On reaching Giaogong, thirteen of the men fell out and had to be sent back to Tangu, suffering from severe headache and mountain sickness, brought on by the height. After this there was practically no illness, and the men stood the excessive height very well. I suppose this is the first time in history troops have been called on to perform duties at such an elevation, and the result has been most satisfactory and very creditable to the Gurkhas, of which the escort was composed.

Altitudes: Rarefied Air.—In my experience of coolies, etc., I find that the height is felt most at from 14,000 to 16,000 feet, and that if they once get over that, going to a still higher altitude has very little further effect. Personally the height does not affect me, and I felt perfectly well at 21,200; nor did the coolies who accompanied me complain at the highest altitudes. My highest camp was at 18,430 feet, and none of us felt any uneasiness, and we all slept very well.

There are two points, viz. Chomiomo, 22,290, and Powhunri, 23,190, which could easily be reached, especially the latter, as there is a long snow-slope right up to the top, up which steps could easily be cut, and it might be interesting to make experiments at these heights.

I believe that nowhere can such heights be reached so easily. Powhunri is the mountain from which the Tista, the Amochu, and the Kosi take their rise, as well as some rivers running north.

Military Aspect of the Frontier.—This has been fully gone into by Major Iggulden, Intelligence Officer, but I may add that once past Giaogong the country offers absolutely no difficulty to transporting an army in any direction, as all the tops of the hills and passes leading into Tibet are flat, and the northern sides slope gradually down into the plains of Tinki Jong, Khamba Jong, or round to the east, north of Powhunri, to the plains across which the road from Phari to Gyantsi runs. All these routes were to be clearly seen, and offer no difficulties whatever.

The further extracts given below are from the Reports of the 1903 Mission. Captain W. F. O'Connor writes in his diary under date July 8—

July 8.—In the afternoon, Mr. White and I climbed to the top of the hill overlooking Khamba Jong, whence we obtained a magnificent and most instructive view of this portion of Tibet lying between the central and southern Himalayan chains. Of these geographical matters I am making separate notes, but I may remark that we were able to discover the drainage to the east of the large Lake Tsomotel Tsing, whose outlet has hitherto been a matter of speculation, and that we have established the existence of an enormous range of snowy peaks extending northwards from the neighbourhood apparently of Mount Everest, and reaching to the central Himalayan chain, and containing several peaks of great apparent altitude, which we propose later to endeavour to measure. Numerous other points of minor interest have also been discovered. Major Bretherton during the morning made a reconnaissance towards the south-west, and found a rich and fertile valley some 3 to 4 miles from Khamba Jong, where grazing is abundant, and where barley crops are raised and sheep and cattle are reared.

On September 14 I find the following entry, which confirms the suggestion I recently made that the Tista valley sucks in the vapours of the plains, and consequently has a worse climate than the rest of the mountain region of Sikhim :—

September 14.—The wind blew without intermission all night. In fact, the Lachen valley is a regular funnel, confined by the two great peaks of Kangchenjhao and Chomiomo on the east and west, up which pours a continuous stream of fog and mist accompanied by a howling wind. We could see this valley smoking like a great chimney from other parts of Tibet and Sikhim, when the sky elsewhere was perfectly cloudless. Minimum temperature at our camp, 24°.

September 21.—Mr. Hayden, of the Geological Survey, arrived to-day. He has examined the fossils which Mr. White had collected, and says they belong to the Jurassic period, and very similar to those found in the Spits shales. As they are marine, they prove, of course, that all this country was some millions of years ago under the sea.

II. MAP OF LHASA AND ITS ENVIRONS.*

By Lieut.-Colonel L. A. WADDELL, C.I.E., I.M.S.

THE map of Lhasa which is issued in this number has been compiled by me from the information which I elicited from several hundreds of natives of the Grand Lama's capital, whom I met during several years. It shows in considerable detail, and I believe with very fair correctness, the leading landmarks of this forbidden city. It may be compared with the small plan published by Mr. Rockhill from Chinese sources.†

The plan of the environs of Lhasa on the same sheet as the plan is based on A. K.'s map, but contains more details.

INDIAN SURVEY—NARRATIVE REPORTS.‡

THE present extracts are but an attenuated edition of the old form of Indian Survey narrative report, which was ruthlessly cut down by a recent Government order. If, instead of cutting these reports down, arrangements could have been made for a wider circulation, the usefulness of them would have been soon recognized, and the justification for their existence established. Beyond a very small official ring, however, they never had any circulation, and it is not surprising that the cost of

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* Map, p. 420.

† *Journal Royal Asiatic Society*, vol. xxiii. (New Series), p. 71. Compare also the plans in Chandra Das's 'Journey to Lhasa,' pp. 149 and 151, and in the Rev. Graham Sandberg's 'Itinerary of the Route from Sikkim to Lhasa' (Calcutta, 1900).

‡ 'Extracts from the Narrative Reports of the Survey of India, 1900–01.' Calcutta: 1903.

publication should have been weighed against their value as contributions to scientific literature, and that the latter should have been found wanting. It is a pity, all the same, that year after year publications should appear, not only in England, but in Europe generally, dealing with Indian subjects—Indian geography and Indian political matters—which contain frequent misapprehensions on plain matters of fact which have long ago been the subject of examination by Indian surveyors, whose statements and opinions have received but an ephemeral official record. It would be easy to give many instances, not only of statistical ignorance which might have been corrected, but of want of map information which might have been found in the Indian Survey record office, still unpublished. It is one thing (in India) to acquire knowledge, and quite another thing to disseminate it. However, the present volume, thin though it be, takes the cream of the year's reports and gives us the best of them. In the field of geodetic survey Indian work has by no means come to an end. Instruments are smaller (a 12-inch micrometer theodolite replaces the old 2-foot and 3-foot instruments); and methods far more systematic and adaptable to the conditions of surveying in mountain and forest land than they were in the days of the Great Arc, conduce to more rapid progress. But the results show that the Indian great triangulation (now extending in Burma) maintains the high level of accuracy which has ever distinguished it. Upper Burma also furnishes a field for topography which is more or less supplementary to cadastral work of previous seasons; the report dealing with the difficulty of basing topography on cadastral compilations. It only emphasizes the advantage (no doubt fully recognized, but possibly locally inapplicable) of a general topographical basis for cadastral work, instead of *vice versâ*. Latitude operations still continue, one party being detailed for this work alone; and there is now added to the terrestrial, astronomical, and tidal operations of this expansive department a specially organized magnetic survey party. In short, India still presents a most satisfactory and practical field for activity in the pursuit of scientific investigation such as is not to be found nearer home, and which makes it all the more a matter for regret that a full record of all the hard-earned information gathered by a most useful department is not at the disposal of the world generally. Compare the Indian Survey report with that of the United States, or of Canada, for instance, and it would certainly appear to the superficial observer that the work of India in the field of surveying was insignificant in comparison. This is very far indeed from the truth. Most interesting, perhaps, and most important are the suggestions in the report connected with the trial of the Jaderin apparatus for base-line measurements. This method is bound to supersede older and more clumsy methods, even for the measurement of geodetic bases. As a rapid means of determining a sound linear value for purposes of triangulation for

geographical surveys it will be invaluable, and the Indian Survey department has done most valuable work in testing its capabilities. The actual results of comparison against a measured base of the Great Arc series have been given in a previous report; this one merely deals with details of adjustment. We do not know that this apparatus has been anywhere so thoroughly and exhaustively tested as at Dehra Dun, the headquarters of the Indian Trigonometrical Survey. Colonel St. G. Gore, R.E., is to be congratulated on the practical efficiency of the department which he administers—a department which now sends useful representatives to all parts of the world. They have been much *en evidence* in Africa and South America during the last two years, and they have fully sustained their Asiatic reputation in those unsurveyed continents. T. H. H.

REVIEWS.

EUROPE.

British Islands.

'Landeskunde der Britischen Inseln.' Von Dr. Richard Neuse. Breslau: Ferdinand Hirt. 1903. Pp. 164.

This little geography of the British Isles is an excellent example of the conscientious work of a thoroughly trained German schoolmaster. The plan is clearly outlined, the space judiciously apportioned, the facts cited are almost all the most characteristic that could be selected, and they are, as a rule, carefully authenticated. The whole handling of the theme is easy, and the touch light, avoiding minute detail and absolutely devoid of the pedantry which we are apt, rightly or wrongly, to associate with the work of an Oberlehrer. At a time when unpleasant controversies which obscure international understanding have not altogether died away, it is pleasant to find a tone of friendly impartiality pervading a book which touches, not without a subdued gleam or two of humour, on national characteristics as well as on the safer ground of physical geography.

A sketch of the general geography of the British Isles is first given, and though it is necessarily incomplete, it is in no way misleading. England and Wales, Scotland, and Ireland are then considered separately in the aspects of physical and political geography, the latter involving a paragraph on each county. The author has consulted the best and most recent books and maps. He explains that his work was delayed by the appearance, just before it was finished, of two works, the want of which he had sorely felt—Mackinder's 'Britain and the British Seas,' and Lord Avebury's 'Scenery of England.' These were carefully studied, and the manuscript revised before printing. We are glad to notice that the author proposes to enlarge the scope of his work, and produce a more comprehensive treatise on the British Isles.

Dr. Neuse does not mention the source of his statistics, and we would suggest that he might refer to the 'Statesman's Year-book' in preparing his larger work unless, indeed, he has the time and patience to dig into the original official documents. In either case he would find that in discussing the number of persons who speak only Celtic languages, he has rather obscured the facts. Not 50,000 (p. 15), but over 500,000 inhabitants of Wales are officially returned as speaking Welsh

only, and the number of Gaelic speakers in Scotland and Ireland are also somewhat in error. There are creditably few misprints in place-names, certainly not more than one would expect to find in an English book of similar scope. Some false impressions may be created by the necessary brevity of the descriptions. From references to streets of dreary two-storied houses in London, and to the lowest classes in Edinburgh living in the highest houses even up to fourteen stories, the German reader might possibly conjure up exaggerated pictures of both towns, but no one can deal with a large subject in small space without running such risks. There are clear black-and-white maps in the text, and eight full-page views of typical scenery, all, as it happens, of mountains, cliffs, or lakes, but all well selected and excellently reproduced. H.R.M.

London: New Streets and Old Sites.

'Old-Time Aldwych, Kingsway, and Neighbourhood.' By Charles Gordon. London: Fisher Unwin. 1903. Pp. xiii., 368. With six Plans.

It may be doubted whether any section of London, so small as that bounded by Temple Bar, the Courts, and Lincoln's Inn Fields, Wellington Street, and Holborn, has ever received more detailed treatment than that accorded in this bulky volume. In four chapters Mr. Gordon deals with the various negotiations which led up to the great work which is now going slowly forward from each end of the new thoroughfare; in which connection it is interesting to note that the idea of a north-and-south thoroughfore somewhere near the site now adopted has been in the minds of the different councils concerned from a date at which William IV. was yet on the throne. After these introductory pages, the author turns to the history of this patch of land, beginning from the derivation of the old name, now happily restored—Aldwych, which appears to be undoubtedly connected with a settlement of Danes in this quarter after King Alfred had established peace with the invaders. It suffices here to say that his story is told with minuteness and care, and makes most interesting reading. Three of the plans reproduced are perspectives of 1560 (Agas') and 1654, and Hollar's map of about 1700. The change in the century between the two first is instructive, for while Agas shows practically open country between the Strand and "Oldborne," with the 1654 plan it would have been possible, until the council got recently to work, to find the way with comparative ease from St. Clement's across to Gray's Inn Road. The illustrations, very largely from old prints, are well reproduced, and show how much of picturesqueness London has sacrificed to unlovely utility. The interpolation of the definite article ('Old-time Aldwych, *the* Kingsway,' etc.) in the title on the cover, is at variance with the title-page; the discrepancy should be remedied in a subsequent edition. O. J. R. H.

Mountaineering in Norway.

'Norway, the Northern Playground.' By William Cecil Slingsby. David Douglas, Edinburgh: 1904. Pp. xviii., 425. With nine Maps.

It is very well that Mr. Slingsby has been persuaded to lay before lovers of "the northern playground," the results of his climbs over the remarkable period of thirty-one years—1872 to 1903. On the sport of mountaineering at large he speaks, of course, with the voice of authority, but he is peculiarly fitted to deal with it in Norway, for there he was its pioneer. He was first attracted to Jotunheim, that wild district whose fringes are even yet scarcely touched by the thousands of visitors to Sognefjord, Nordfjord, and Gudbrandsdal. Romance clings about its very name, "the home of the mountain demons," and it is a fitting

seat for them, as appears from Mr. Slingsby's appreciative accounts of sombre valleys which human foot may hardly penetrate, and untrodden snow-peaks from the ascent of which the natives shrank at first through fear of something more than mere physical difficulties. Here, after erecting the first cairn on many peaks, Mr. Slingsby at last succeeded in conquering the giant Skagastölstind, accomplishing, on his first ascent, the last few hundred feet alone—a remarkable triumph over a most difficult task not unaccompanied by danger. The author also takes us to the glaciers of Jostedal (surely so, not Justedal), to Söndmöre (not Söndmore, as in the map), and to the famous peaks of Romsdal. His work in the further north, however, as for instance in Lyngen, and in Lofoten, where he accompanied Dr. Norman Collie last year, he merely indicates.

Science is kept in the background. The book is simply a colloquial and very charming account of the author's travels, the more charming in that he does not, like some who are sportsmen and nothing more, condemn a holiday and the country where it was spent out of hand because sport failed. His failures, in the face of bad weather and other adverse conditions, were frequent. But he loves the country, and describes it for its own sake; he is a scientific student of scenery, moreover, for geological formations find frequent mention in their bearing upon the surface met with by mountaineers; nor are the fauna and flora of the various districts ignored. In short, this is a book of thoroughly general interest, for Mr. Slingsby happily rejected the counsel of friends who "wished me to keep well above the snow-line."

The full-plate photographs are very beautiful, but the line drawings in the text are, unfortunately, not commendable. Nor are the maps of value; those which are merely reference-diagrams serve their purpose, but in the large-scale maps of confined districts the contours are apparently only imaginary, or even if they are approximately true, no reference is given to the elevations they represent, nor are the summit-heights marked. O. J. R. H.

A Type of Alpine Mountain Structure.

'De Sonnwendgebirge in Unterinnthal.' By Dr. Franz Wähner. Part I. Leipzig Franz Deuticke. 1903.

This fine monograph, the fruit of many years of patient research, treats of the geological structure and orographical features of a small mountainous area in the Austrian Tyrol—the Sonnwendgebirge, otherwise known as the Rofan group. The stratigraphical succession includes all the representatives of the lower Mesozoic rocks in that part of the Alps from the base of the Triassic through the Rhaetic to the Upper Jurassic (Malm), and the alternation of white masses of dolomite or limestone with red Liassic strata and brownish radiolarian cherts and cherty shales gives the rock-scenery considerable variety and expresses the geological structure very clearly in the superficial configuration. In consequence of the alteration of the rocks by pressure metamorphism, fossils are comparatively rare, but they are sufficiently common to establish the position of all the members of the series. The author has come to the conclusion that the Jurassic limestones are mainly coralline, and that, with the radiolarian cherts, they indicate the prevalence of deep-sea conditions in this region through a long period. This is really a reversion to older views regarding the origin of these strata.

More interest centres, however, in the orogenic features of the district than in its lithology. The standpoint of the author is that to which most students who are engaged in unravelling the geological history of mountain districts at the present day have been led. Formerly the Sonnwendgebirge were regarded as of exceedingly simple structure; their rocks were considered to be of great thickness,

and a few dislocations and comparatively simple folds were held to be the only important disturbances of which there was any evidence. Minute investigation has shown that not one of these assumptions is valid; the great apparent thicknesses of some of the limestones are due to their having been piled up by earth-movements; the rocks are traversed by many great thrusts, which have only a gentle dip, and consequently simulate bedding planes; in many places the strata are intensely folded and much compressed. The student of British geology is strongly reminded of the manner in which the earlier views regarding the structure of the north-west Highlands have been superseded by the ideas of Lapworth and the Geological Survey of Scotland.

That the author is right in his contentions cannot be doubted by any one who examines the excellent photographic plates by which his monograph is illustrated. Advantage has been taken of the fine cliff-exposures to secure panoramic photographs which are almost as clear as diagrams (and much more convincing). Their effect is heightened by the introduction of colour to distinguish those strata which are somewhat like one another in the photographic print. To make these plates a success the co-operation of Prof. Eder has been secured, and no better illustrations of mountain geology have ever been produced.

The structures are very like those of the "thrust-belt" near Assynt, in Sutherlandshire, but minor differences are often apparent, as every mountain area has its peculiar features. The innumerable smaller thrusts and reversed faults, so common in the Cambrian limestones of Scotland, are seemingly absent, and great inverted folds of the strata, often passing into thrusts, and at other times much distorted by pressure, are very common. It is interesting to notice that there seems to be a tendency to the representation of the attenuated "middle limb" of the folds, and the author's conclusions, in this respect, are intermediate between those of the two extreme schools of modern geological speculation.

The limestones have usually been marmorosid by the pressure, but in places they are brecciated, and this also is characteristic of the hornstone breccias of the Jurassic which overlie the red Liassic limestones. These are often a perfect crush conglomerate, resembling in all its features those described by Lamplugh in the Isle of Man. The original strata seem to have been thin alternations of red shales and bedded radiolarian cherts, and such a series, when exposed to folding stresses, very readily breaks up into a mixture in which rounded and angular fragments of the harder ribs are scattered through a matrix of the soft clay. Most of what is said in connection with the development of such "dislocation-breccias" is already well known in Britain, though similar cases have not yet received much attention on the Continent.

An abstract of the earlier literature serves as an introduction to the book, and is both clear and useful, though the author is an unsparing critic of the earlier investigators. One great defect of the volume is that it is not accompanied by a satisfactory map—only a sketch-map is given—as this makes it impossible to gain a clear conception of the manner in which the folds and thrusts map out on the surface, a point which is at least as important as their behaviour in section. No doubt this will be remedied when the second part of the monograph appears. In all other respects the book is worthy of the great labour expended in the researches which it embodies. J. S. F.

ASIA.

A Woman's Work among the Sarts.

'In Russian Turkestan.' By Annette M. B. Meakin. London: George Allen. 1903. Pp. xvi., 316. With a Map.

Miss Meakin's travels, of which this book is the outcome, took her to Tashkent, to Kokand, Margelan and Andijan, to Bokhara and Samarkand, to Merv and Askhabad. She sets forth her impressions simply, with a slight historical preface, and confines herself almost wholly to the inhabitants of Russian Turkestan and their circumstances, touching but lightly on the physical geography of her route. She has chapters on native industries—irrigation and cultivation, cotton and silk production; on means of travel, religion, and the common mode of native life; and it is in one department of the last subject that her work is of the highest value. She is indebted to the Russian authorities, from the Tsar himself downwards, for extraordinary facilities in the way of travelling, of the provision of interpreters, and so forth. She has made use of her opportunities to give a detailed and vivid picture of the curious conditions under which the Sart woman passes her life, from childhood, through early wifehood, to old age. The value of this part of her book is sufficiently expressed in the sentence, "Gentle male reader! you shall now come with me in spirit, where, in the flesh, you will never be permitted to enter . . . to the only place where a respectable Sart woman may be seen without a veil—her home." This would seem to be the best mission a woman traveller can take upon herself—to bring herself into touch with her native sisters in whatever land she may be, and, by becoming thoroughly intimate with them, to produce work of which a man must always be in a greater or less degree incapable.

The illustrations, from admirable photographs, resemble the subject-matter in generally displaying native life. The map is merely an incomplete diagram of the authoress's route. O. J. R. H.

Dutch Borneo.

'Bijdragen tot de Geographie van Borneo's Wester-Afdeeling.' Door J. J. K. Enthoven, Chef van den topographischen dienst in Nederlandsch-Indië. 2 vols. Leiden: E. J. Brill. 1903.

The western department of Dutch Borneo consists almost entirely of the basin of the great Kapuas river, which has an area of about 37,000 square miles, or nearly that of Scotland and Wales combined. Through this the Kapuas flows for a distance of 710 miles, descending rapidly from the mountains, and then making its way slowly to the sea, for the plain of the upper Kapuas has an altitude of only 160 feet. More than other parts of Dutch Borneo, the western department has attracted travellers and scientific explorers, and in quite recent years Prof. Molengraaff and Dr. Nieuwenhuis have visited many of the remote districts, and added much to our knowledge of the geology and ethnology of the territory (see *Geo. Jour.*, vol. xviii. p. 295). Heer Enthoven has therefore been able to collect sufficient material for a general description of the department, and, of course, his position enables him to obtain the fullest information possible, both by his own observation and from the reports of his subordinates, explorers, and natives. The work is very full, and is systematically written. Each of the six districts is geographically described, and its natural resources commented on; the tribes are enumerated, and their manner of life, occupations, and social condition are portrayed, and their political relations, both to the native rajahs and the Dutch Government, are dealt with. Naturally, political and economic questions are

of especial interest to the author. As an official, he regards the country as a source of material wealth, and the people as agents by whom this wealth may be exploited for their own material and moral benefit. At present the outlook is not promising, and Heer Enthoven remarks that the picture he has drawn is not rose-coloured. One great difficulty that has to be overcome is the want of satisfactory means of communication. The Kapuas and its tributaries are all blocked by rapids, and in their lower courses are subject to floods in the rainy season, which often ruin large areas of cultivated land, while in the dry season the water is too low for easy navigation. Roads do not exist, and immeasurable tracts of low marshy country require draining to render them productive. A very large amount of capital would be needed to open up the country and improve its agricultural capabilities, but Heer Enthoven believes that the outlay would be profitable. A still more serious want is population. The native inhabitants are relatively few, and their spirit has been crushed by the oppression of the Malay princes, many of whom have become impoverished, and can contribute nothing to the development of the country. Something has, indeed, been accomplished by the Dutch administration; the savage Dyaks have been to a great degree humanized; the exactions of the Malay princes have been restricted; and the people are becoming more and more conscious of the advantages they derive from the government. The paucity of the population might, Heer Enthoven suggests, be remedied by importing Javanese, who often leave their crowded country, travelling even as far as Surinam.

Sakhalin.

'In the Uttermost East.' By Charles H. Hawes. With Illustrations and Maps. London and New York: Harper Brothers. 1903. Pp. xxx., 478.

This charming book is mainly an account of investigations among the natives and convicts of the island of Sakhalin, but it also contains notes of travel in Korea, Manchuria, and Siberia. No Englishman has hitherto explored the northern part of the Sakhalin upland, and there exists but little in our language about the primitive Gilyaks and Orochons of this great island and of the neighbouring mainland. Mr. Hawes, believing that with the expansion of the penal settlements and the future development of the resources of Sakhalin, the decay of the native must follow, made it his special object to record the aboriginal custom and myth, literature and religion, before they perished. In the course of the narrative many notes are given upon the fauna and flora of the island. As to the state of the penal administration and of the exile settlers, the author reminds us that Sakhalin is the colony to which Russia's worst criminals are despatched, that it is over 6700 miles from St. Petersburg, and that in the last twenty years improvements have taken place even here; but when all is said, it remains true that the Island of the Black River still lags, as in the past, many years behind the average penal settlement on the mainland. In chapter vi. is given a short sketch of the history and general features of Sakhalin. The rest of the book, including the notes on Korea and Manchuria, is mainly personal narrative, in which trivial incidents of ordinary travel are used to illustrate the daily life, manners, and customs, both of native and white man, in this part of the world. In certain chapters (*e.g. In the Bay of Ni*, where he tells the story of the Gilyak bear-fête) Mr. Hawes traverses much the same ground as M. Labbé, in his study of Sakhalin. The main interest of the present volume certainly lies in its pictures of the primitive, now decaying, tribes of Sakhalin; but the author's account of his journey across Manchuria, and so home to Europe by the Siberian railway, is good reading likewise. A delightful humour and an admirable collection of folk-stories will not perhaps impair the

circulation of the 'Uttermost East.' The tale of the Gilyak family, bitterly lamenting, not because of any death in their house—that would have been nothing—but because the needle was lost, is perfect in its way. C. R. B.

An Indian Province.

'Chota Nagpore, a Little-known Province of the Empire.' By F. B. Bradley-Birt. London: Smith, Elder. 1903.

There is much in this book which will be new to the British public, and equally so to the ordinary cold-weather visitor to India, who rarely sees much of the country away from the great cities and the main lines of communication. Chota Nagpore has up to the present remained remarkably little touched by modern change, and though things have begun to move forward of late, it still retains in part the character of a *terra incognita* which a century ago belonged to it in reality. To the student of primitive peoples, their traditions, and way of life, it presents an interest hardly equalled by any other province of the empire, the many unsolved problems regarding the origin and early history of its varied races giving it a special and romantic charm. Mr. Bradley-Birt touches in an interesting way upon many of these questions, besides supplying here and there side lights on the history of British relations with the province. The book, however, can lay no claim to be a systematic account of Chota Nagpore, and we miss especially such description of its physical features as might enable us to form a clear picture of the scene in which the recorded events took place. The references here and there to the central plateau and the part played by it in the history of the native races are too vague to be very instructive. The book, in fact, consists of a series of more or less disconnected sketches, interesting enough in themselves, but without any decided co-ordination. Of the many elements in the population—Kols, Oraons, Cheros, Pahariyas, Santals, and others, the most detailed accounts are given of the Hos or Fighting Kols, and the Santals, although it is only an outlying section of these last which falls within the limits of the province. The Hos are of special interest from their jealous exclusiveness, which, aided by the natural strength of their country (the division of Singbhum), has enabled them to hold their own against all comers to the present day. A chapter is devoted to the Grand Trunk Road, and the vicissitudes of fortune which various parts of the province have experienced with the changing economic conditions are clearly brought out. At the present day the whole activity centres in the coal-fields of the east, and it is to the development of these that the recent decision to transfer the Gobindpur subdivision from the non-regulation province of Chota-Nagpur to the more elaborate administration of Bengal has been due. The book is provided with a map and some good illustrations of native life, etc.

AFRICA.

Benin.

'Great Benin: its Customs, Art, and Horrors.' By H. Ling Roth. Halifax (England): F. King & Sons. 1903. Large 8vo, xii. + 234 + xxxii. pp. and 275 Illustrations.

Probably no event in the recent history of the Dark Continent has attracted more general attention than the British occupation of "the City of Blood," consequent upon the massacre of Vice-Consul Phillips' party in 1897. The wide-spread interest caused by the capture of this hitherto inaccessible "African Lhasa" naturally found expression in a copious literature, which is largely summed up, with much valuable added matter, in Mr. Ling Roth's comprehensive and profusely

illustrated volume. An opening chapter is occupied with a carefully annotated bibliography, ranging from Ruy de Pina's 'Chronica' (1440–1523) down to Captain Roupell's 'Original Notes' (1898), and with such scanty historical data as may be gleaned from the vague or disjointed remarks of Dapper, Nyendael, Barbot, and other early observers looking at the place from a safe distance. From these and other more trustworthy or better-informed later writers, such as Landolphe, who gives his name to the *Landolphia* of botanists, Belzoni, Fawckner, and the ubiquitous Burton, are drawn sufficient ethnographic materials to fill the great bulk of the volume with a detailed account of the physical and mental characters, social and religious institutions, government, and general pursuits of the people, with a discussion on the local "architecture," its curious classical (?) or Portuguese (?) contacts, and ingenious drainage system.

This leads up to the concluding chapters on the Benin "School of Art," in which is, of course, centred the chief interest of the book. No doubt much has already been written on this fascinating subject, as, amongst others, by Messrs. Reade and Dalton, F. von Luschan, and Karl Knorr. But we have here, for the first time, a full statement of the case, with an accurate account of the technique and of the problems involved, the whole amply illustrated with faithful reproductions of the ivories, plaques, bronzes, in low and high relief and on the round, from specimens drawn from all available sources. It is impossible to enter into details in the limited space available, and it must suffice to give the general conclusion of the author, who holds that the bronze castings, if not the carvings, are certainly unique, there being "absolutely nothing like them in any other part of the world. . . . We have in them a form of real native art," in which "we can trace to some extent progress and decadence; and in the general carving and ornamentations we can see very clearly the process of the evolution of new forms out of the primitive realistic representation." He recognizes Portuguese influences at a certain stage of development, but still thinks the art is truly indigenous, antecedent to all foreign contact, marked by rude beginnings and a flourishing period followed by slow decline and extinction. A. H. K.

Nile Exploration.

'The Story of Exploration.' Edited by J. Scott Keltie.—'The Nile Quest.' By Sir Harry Johnston. London: Lawrence & Bullen. 1903.

It is particularly fitting that the first volume issued of this new series, which is to treat in turn of all the great episodes in the history of exploration, should be devoted to the problem which above all others has exercised a fascination on the minds of civilized men, but which, strange to say, has never yet received worthy treatment as an independent item in the general story.

The standing of Sir Harry Johnston, both as a writer and an authority on African affairs, is a guarantee that the theme has been treated in no commonplace style. The book is characterized, most of all perhaps, by the breadth of outlook which helps the reader to grasp, not a mere succession of facts, but the relation in which these stand to the general currents of world-history. Thus the influences which made for or against an advance in knowledge of the Nile at each successive epoch are briefly but clearly sketched. The early chapters trace the position of the problem during the ascendency of the Egyptians, Greeks, Romans, Arabs, and Portuguese, while the latter part of the book is necessarily taken up with the more detailed story of modern exploration, in which Speke's great achievement receives the prominent place which is its due. There are many interesting items respecting travellers unknown to the general public, while in the case of the

better-known figures, the author's intimate relations with the world in which they moved have supplied a vivid personal element impossible in a mere compilation.

Among the questions dealt with, some, of course, are more or less controversial, and the author's views on certain of these may not be accepted by all. He has no doubt that Ptolemy's Nile lakes argue some real knowledge of the great equatorial reservoirs, though the opponents of this view could probably make out an equally strong case for the marshes of the White Nile and Sobat (combined with vague rumours of snowy mountains derived from the east coast) as the real suggestors of the "Nili paludes."* Most open to criticism, perhaps, is the treatment of the evolution of Nile cartography from the fifteenth century onwards, which fails to bring out the strictly Ptolemaic basis of the Dapper type of map, as shown by the gradual transformation of the picture through the maps of Waldseemüller, Mercator (from 1541 onwards), Gastaldi, Ruscelli, Forlani, Ramusio, Ortelius, and others, most of them more or less involved in the current of Ptolemaic criticism, and little influenced, as regards the delineation of the Nile, by information derived from Portuguese sources, to which the author ascribes the moving inspiration.† In regard to the work of the Jesuits in Abyssinia, and the narratives published by them, there are one or two slips which will doubtless be rectified in a second edition. Mention might then be made, perhaps, of D'Almeida, whose important chronicle exists in manuscript in the British Museum; of the journey of Father Fernandez, which first defined the limits of the Nile basin south of Abyssinia; and the treatise of Vossius, 'De Nili . . . origine.'

An interesting "roll of fame" gives the names and nationalities of the principal modern explorers of the Nile. Apart from the omission of Dr. Kandt, the explorer of the ultimate headstreams of the famous river, it neglects no important names, though opinions may differ as to the degree of merit assigned to each by variety of type. Many would rank Paëz rather above than below Lobo, and Baker than Schweinfurth, in relation to *Nile* exploration; while Bòttego seems to deserve fuller recognition as the first explorer of the Sobat system, and Messrs. Crosby and Le Roux might perhaps have been mentioned as the first to bring to light the remarkable bend of the Blue Nile. But these are mere matters of opinion. Reference must be made, lastly, to the excellent series of photographs, which will greatly help the reader to picture the actual scenes; to the numerous reproductions of important maps; and to the remarkably tasteful general get-up of the volume.

E. H.

AMERICA.

South America.

'Trade and Travel in South America.' By Frederick Alcock, F.R.G.S. London: George Philip & Son, Ltd. 8vo. 573 pp.

This is an extremely valuable book for the merchant, the ordinary traveller, and reader who may be in search of general information regarding the states of South America. It is replete with commercial data, showing the growth and prosperity of the various nationalities, and also contains much that relates to their

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* Otherwise the Sobat is not represented at all in the Ptolemaic system.

† Even the wall-paintings at the Vatican (to which, by the way, Sir Harry Johnston assigns a somewhat too late date) seem to fall in part within the Ptolemaic influence, as was shown long ago by Thomassy ('Les Papes Géographes').

past and present political condition. A general idea of the geography of each country is also given, and a number of useful and well-executed maps give value to the work as a whole, while numerous carefully selected illustrations add to the instructive nature of its pleasantly written pages.

Perú.

'El Perú.' By Antonio Raimondi. Estudios Mineralógicos y Geológicos. Tomo iv. Publicado por la Sociedad Geográfica de Lima. Lima. 1902.

It reflects honour upon the Government of Perú, that it should recognize the importance to the world of completing, at considerable cost, the publication of the scientific data collected by the great Italian naturalist Raimondi during his life-long labours in that country. Up to the day of his death, in 1890, the first three volumes of his great work on Perú had appeared; and now, under the very intelligent editorship of several members of the Geographical Society of Lima, we have the fourth royal quarto, to be followed by a fifth on the same subject as the one under notice. To accompany this work, a great map of Perú is in course of publication in Paris, and we shall hope to learn of its completion at an early date, as it cannot be other than of immense value to make better known the geography of a country which has future possibilities of no ordinary nature.

Said our friend Raimondi in the preface to vol. i. of 'El Perú:' "I have dedicated nineteen years to the first part of my project alone, that is, in the gathering of materials. If my existence be prolonged as many years longer, I shall agreeably employ them in crowning my task by the study and publication of all the objects and data gathered in my excursions throughout the Republic."

It was not permitted that he should realize the wish of his heart; but Perú is evidently not ungrateful nor blind to the value of his labours, as witness the volume before us. This opens with a short chapter on certain features of the geography of the country, and is then followed by a long description of the various mineral specimens collected by the author during his excursions. A treatise on the mineral and potable waters of Perú follows, and is of the highest interest, as it not only refers to the arid region of the Pacific coast, but to the Amazon districts, and to the inter-Andean tablelands from the southern to the northern frontier. It concludes, under title of 'Trabajos Sueltos,' with a long series of geological studies, which include the numerous large and small islands of the coast, its ports, bays, headlands, and capes, followed by a 'Memorial on the Cerro de Pasco and the forests of Chanchamayo,' in which the geological features and history of that famous silver mountain and its environs are outlined with the accustomed ability of the author.

G. E. Church.

AUSTRALASIA.

A Varied Life.

'Australiad.' By Henry Taunton. London: Edward Arnold. 1903. Pp. xi., 247.

When a man of varied and unusual experiences has the wit to shape them into a plain narrative, without veneering, the result is bound to be of interest. Mr. Taunton's sub-title is 'Wanderings in Western Australia and the Malay East,' but the greater part of the work deals with the colony, where he ranges from Freemantle to Geraldton and from Geraldton to the Fitzroy. In his work, too, he passes from sailor to "new chum," thence to the practised stock-keeper, thence to the pioneer, and finally to the pearl-fisher. Without any attempt at artistic word-painting, the descriptions are vivid (that of the multitude of voices of the night in the bush is among the best), the country is clearly pictured, and on the Australian

native Mr. Taunton is especially interesting. A statement as to the making-up or "faking" of the great Southern Cross pearl is claimed to be the first showing the facts of the case. Mr. Taunton has a theory of his own as to the production of pearls—that they are simply the result of nature, "having erred in her original estimates," and coming "to be embarrassed by surplus material;" he takes as parallel cases excrescences and abnormal growths in trees and the bones of animals, or hard lumps occurring in rare stones. These, he submits, "are all pearls."

His story would make excellent reading for a boy's holiday task on Australia. For any general reader it was worth the telling.

O. J. R. H.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Illustrations of Physical Geography.

'La Terre: ses aspects, sa structure, son évolution.' Par Aug. Robin. 4° pp. iv., 330. Three coloured maps, 760 reproductions of views of scenery, 53 plates of characteristic fossils, 158 figures. Paris: Librarie Larousse. Price 13*s*.

The sub-title of this book, "Géologie pittoresque," concisely describes it, and the list of illustrations noted above shows that there is no lack of graphic treatment of the subject. Even the index has its pictures. Two-fifths of the book deals with contemporary phenomena, two-fifths with the formations of the past, and one-fifth with the Parisian region, man, minerals, and the past and future of the Earth. All parts are admirably illustrated. The views are judiciously selected and well reproduced, and many of them, *e.g.* the Alpine ones photographed by Sella and by Tairraz, could hardly be bettered. The book is the best picture-book of physical geography and geology which we have seen.

HISTORICAL GEOGRAPHY.

The Ophir Question.

'Tarshish and Ophir.' By Gustav Oppert. Berlin. 1903.

In this learned but somewhat belated essay, which appeared originally in the *Zeitschrift für Ethnologie*, vol. 37, Prof. Oppert offers "a final solution" of the secular Tarshish-Ophir question. But no fresh light is brought to bear on the subject, which, in fact, is left as it stood over three decades ago, that is, before it assumed a new aspect in consequence of the re-discovery and exploration of the old gold-workings and associated monuments in Southern Rhodesia. The author is still lost in the tangle of time-worn etymologies, from which no sure inferences could ever be drawn, and seems unmindful of the fact that the problem has long since passed from the hands of the philologists to those of the archæologists. More than full recognition is certainly given to the services of Karl Mauch, who is unduly credited with the re-discovery of the Zimbabwe ruins. Long quotations are also made from the early Portuguese writers, de Barros and dos Santos, but none at all from Bent, Hall, Neal, or any of the other recent observers, who are only once referred to by name at the very end of the paper. Fresh light is thus excluded from almost the only source whence it might have been drawn, so that this essay will scarcely be accepted as "a final solution of the old controversy."

Under these circumstances little importance can be claimed for the author's personal views, which are concerned mainly with the identification of the Tharshish

and the Ophir of the Biblical texts. The two places, so intimately associated in these texts, are here divorced, and Tharshish is again relegated with some of the old commentators to the Iberian Tartessus beyond the Pillars of Hercules. To my contention that there must have been a Tharshish in the Indian ocean also, the reply is that the Tharshish of Kings and Chronicles is not a seaport, but either means "the sea" (the origin possibly of the Greek word θάλαττα itself!), or else has been foisted into the texts by the authors of those Books instead of *Ophir*. Hence where *Tharshish* occurs (as in 1 Kings x. 22) as the objective of Solomon's gold expeditions we are to read *Ophir*. The original Ophir is allowed to have been where I place it on the south coast of Arabia. But then, the name was extended to some other place (say Sofala) on the east coast of Africa, while all the triennial gold expeditions where no objective is named were to India, "since India is not Ophir, and the Solomonic Ophir not India, but East Africa." Such, briefly, is the new theory, which is supported by no new evidence, and ignores the vast body of archæological evidence drawn in recent years from the prehistoric remains in Southern Rhodesia.

A. H. Keane.

Marco Polo.

'The Book of Ser Marco Polo the Venetian concerning the Kingdoms and Marvels of the East.' Translated and edited by Sir Henry Yule. Third Edition, revised throughout in the light of recent discoveries by Henri Cordier, of Paris. With a memoir of Yule by his daughter, Amy Frances Yule. 2 vols. London: John Murray. 1903. Pp. cii., 144, 462; xxii., 662.

It is now more than twenty-eight years since Yule published the last edition of his 'Marco Polo' (1875), and in that time a vast amount of work has been done. The regions of Asia through which the Polos travelled have been diligently investigated from many points of view, and a flood of light has been thrown on some obscure points in the journeys of the Venetian *Millione* and his relatives. It is the object of this new edition to present the results of recent study and travel affecting the Polo narrative. Almost all Yule's original notes have been preserved, even those which have rather a theological than a scientific interest; very few have been altered, even where a certain re-casting was desirable; but a great number of fresh annotations have been inserted. A memoir of Yule, and a bibliography, extending from p. xxvi. to p. lxxxii., have been added. Yule's original introduction has been slightly augmented (from 139 to 144 pages). In the text itself, the first volume of the new edition reaches 462 pages (against 444); the second volume, 605 (against 552), not counting the index. But as a much smaller type has been employed for the notes, the additions are more considerable than appears from a mere enumeration of the page-numbers.

As representative of the treatment of the whole work, we may notice that M. Cordier makes fifteen additions of importance to Yule's Introduction, six additions of the same character to the old notes on Polo's *Prologue*, and thirty-six to the old notes on the first twenty-five chapters of Book I.; in other words, there are few subjects of importance discussed in Yule's commentary which do not find here an illustrative appendix, longer or shorter. The word *Khan*, the route of Marco Polo in Persia, the exact position of the Polos' Venetian home, the Khanate of Kipchak, the town and state of Bolghar on the Volga, the script used by the Mongols, the nature of *buckram* and *baldachin*, so often mentioned by thirteenth-century travellers, the Baku oil-fields, the pass of Derbent, the various names for the Caspian in the Polos' time, the Jacobite sect, the position of Tabriz in thirteenth- and fourteenth-century trade, the chief types of mediæval ship, the Dry Tree, the

Old Man of the Mountain,—these are some of the points on which M. Cordier supplements the already elaborate remarks of the edition of 1875. We may perhaps regret the enormous bulk which has thus been given to the standard English edition of Polo, but the French scholar has touched little that he has not adorned, if adornment lies in the increase of utility. It is perhaps too much to expect that, when so great an increase of the old work was carried out, the original French text of the Polo narrative might have been added in a small-print appendix (for what scholar can depend ultimately on a translation?). In Book I., chapter x., note 1, the pilgrimage of Antoninus of Placentia is called by Yule 'apparently earlier than' the Polos' visit to Jerusalem in 1270. M. Cordier has not modified this, yet there exist at least four manuscripts of Antoninus earlier than A.D. 1000, so that 'apparently' might have been omitted. In chapter xlvi., note 1, of the same Book I., the Russian re-discoverer of Karakoram, N. Yadrintsev, appears as Iarindsev. There are other matters to which critical attention might be drawn, but it would be absurd to spend much thought in finding fault, for the care and accuracy with which the undertaking has been carried through are, on the whole, remarkable. The articles of General Houtum-Schindler, and the books of Lord Curzon and Major Molesworth Sykes, on Persia; M. Grenard's account of the mission of Dutreuil de Rhins in Central Asia; the 'Mediæval Researches' of Dr. E. Bretschneider; the writings of Palladius; the studies of Mr. Rockhill on Tibet and on William de Rubruquis; and the 'Recueil de Documents de l'Epoque Mongole' of Prince Roland Bonaparte, have been the principal accessories to M. Cordier's independent labours in the preparation of this much-needed and long-expected re-issue of the Venetian traveller. C. R. B.

Ancient Geography.

Quellen und Forschungen zur alten Geschichte und Geographie.' Herausgegeben von W. Sieglin, o. ö. Professor der historischen Geographie an der Universität Berlin. Heft i.: 'Die Beschreibung Italiens in der "Naturalis Historia" des Plinius und ihre Quellen' (D. Detlefsen). Leipzig: Eduard Avenarius. 1903. Heft v.: 'Palästina in der persischen und hellenistischen Zeit. Eine historisch-geographische Untersuchung' (Gustav Hölscher). Berlin: Weidmannsche Buchhandlung. 1903.

These two studies, on Pliny's account of Italy in the 'Natural History' (vol. iii. pp. 38–75, 95–138), and on Palestine in the Persian and Hellenistic periods, are admirably executed. In the former, special attention is devoted to Pliny's principal sources—Augustus' 'Descriptio Italiæ,' Agrippa's 'Chorographia,' the other measurements and maps of the early Imperial time, the ethnological writings of Cato, Nepos, and Varro—as well as to his less important and doubtful authorities, Licinius Mucianus, Livy, Verrius Flaccus, Masurius Sabinus, Julius Hyginus, Statius Sebosus, Valerius Antias, Caelius Antipater, Cornelius Alexander Polyhistor, and others. A thorough acquaintance with all the recent literature relative to the world-map and descriptions of Augustus and Agrippa, a previous study of the question in his 'Weltkarte des M. Agrippa,' and an independent examination of the chief manuscripts of the 'Historia Naturalis,' abundantly qualify the author for his task. One would, however, have expected greater use of, and more frequent reference to, Philippi's admirable study, 'Zur Rekonstruktion der Weltkarte des Agrippa.'

Equally excellent is Dr. Hölscher's study of Palestine under the Persians and the Greeks. The division of the Persian empire into satrapies by Darius (in its relation to Palestine); the origin of the distinction of ἡ ἄνω Συρία and ἡ κοίλη

Συρία; the history of Phœnicia (considered as a Syrian coast region); the beginnings of Arabic influence in Syria through the Idumæans; the Nabathean kingdom in Edom; the Jews immediately before and after Nehemiah; the Samaritan schism; the problem of Scythopolis; the province-divisions formed by Seleukus Nikator; the boundaries of Syria and Egypt under the Seleukids and Ptolemies; the Hellenizing policy pursued by Alexander's successors in Syria by means of city-foundations; the history of the Jewish people after Alexander; the monarchy of Hyrkanus, Aristobulus, and Alexander Jannæus; and the establishment of the Roman province of Judæa; form the chief divisions of a most interesting and valuable monograph.

It is to be hoped that Dr. Sieglin's plan of publishing the most important of the ancient historico-geographical texts, as well as a series of studies upon the chief problems of ancient and of early mediæval geography and geographical history, will meet with cordial support. Nothing more useful could well be imagined than the full list of his 'Quellen und Forschungen zur alten Geschichte und Geographie.' Up to the present, besides the two we have noticed here, four other essays have appeared, respectively devoted to old Persian history, to the history of the first discovery and exploration of Britain, to the history and topography of the Austrian lands under the Romans, and to the island of Eubœa. More than twenty other similar studies are now ready, or nearly so, and we trust that this number may be at least doubled.

GENERAL.

Water in Landscapes.

'Light and Water.' By Sir Montagu Pollock, Bart. London: George Bell. 1903. Pp. xii., 115.

This work is explained in the sub-title as 'A Study of Reflexion and Colour in River, Lake, and Sea.' The proper reflection (to follow the convention of most printers' chapels) of objects in water is frequently missed, as the author points out, even by great artists. Naturally, it follows a fixed series of laws. In this book are shown very clearly by diagrams the precise effects observed in still water from different elevations, and then the various orders of reflection given by various forms of ripple, from the hurrying waves thrown up by a brisk breeze, to the slow oily swell which stands next to a condition of absolute calm. The different standard forms are shown in beautiful photographs; in one appears the effect of flattened rings familiar on a slow-moving, leaden surface of water; in others, the difference between the narrow sun-streak, with the sun low and the sea calm, and the wide streak, with the sun high and water rough, and so on—a series as excellently selected as reproduced. Even when the author passes from the forms of reflection to colour, the half-tone reproductions are of value in showing differences of shade. In a note on the colour of water, setting forth the selective absorption theory as generally preferred to that of selective reflection, the author quotes a long and interesting dialogue, "substantially in accordance with modern ideas," from a rare anonymous work of Sir Humphrey Davy, 'Salmonia, or Days of Fly-fishing,' published in 1828. O. J. R. H.

Commercial Geography.

'Handbook of Commercial Geography.' By G. G. Chisholm. 4th Corrected Edition. London: Longmans. 1903.

A general description of a book well known to every student of economic geography is unnecessary; it is sufficient to note that in the main design and

arrangement of the work there is no change. It remains essentially a book of reference, needing for its correct appreciation a previous acquaintance with the general principles of geography. But the new edition is of great interest for purposes of comparison. It provides an index to the progress of geographical method, and to the change in the relative values of different regions and groups of geographical and economic phenomena. From this point of view the modifications and additions are of the highest importance. In the latest, as compared with the earlier editions, there is more tendency to emphasize the purely physical basis of commercial and economic changes. This tendency appears in the general treatment of climatic conditions and in the increased space devoted to communications, past and present, in their relation to physical features. Another factor in economic development, which has been somewhat neglected by writers on geography, receives from the author more adequate treatment. Brief sketches are inserted of the significant facts in the history of important regions. In most cases these additions are essential to the attainment of a correct perspective, though they are not without value as a relief to the general reader from the severer technicalities of the subject. The digressions on the present conditions and future prospects of certain commodities, in relation to the demand of the world, serve a like purpose.

The chief modifications and additions are best illustrated by following the grouping of countries adopted by the author. In the section dealing with the British Isles, more space is given to the question of railway communications in relation to physical features and the possible development of other means of internal transport. The bearing of the export of coal on the shipping trade is discussed, and the agricultural position in Ireland receives a brief notice. In view of present controversies, the new map of the coal and iron districts of Great Britain will be found of service. The present economic situation is illustrated by historical references to the growth of British trade and policy in earlier periods.

On the Continent, the significance of the waterways of France, Holland, and Belgium, as factors in commercial development, is well brought out; while the importance of geographical position is illustrated from the early history of Marseilles. The sections dealing with the German Empire are enlarged considerably in the recent edition. The elaboration of the German system of waterways is shown in a new map, while the relative value of Hamburg and other seaports is thoroughly discussed both from the historical and the geographical standpoint. Increased space is also given to the coal and iron regions of Central Europe, as bearing on modern industrial changes. A special map is added. Turning to the south, we find the relations of Italy with South Germany discussed with reference to the problem of Alpine communications. The renewed importance of the Italian cities is, perhaps, sufficient justification for a somewhat detailed discussion of their early history. This portion of the book offers many excellent illustrations of the essential physical bases of economic prosperity. The recent revival of interest in the commercial possibilities of the near East is responsible for large additions. The sketch of the ancient commerce of Asia Minor and Arabia, with the account of present railway projects, will be of great value to the student. In the far East, attention will naturally be directed to the sections dealing with the Russian conquest of Siberia, the Chinese system of government and treaties, the coal of Shansi, the railways and cotton mills of China, and the part which may fall to this region in the industrial growth of the world. On all these points there are substantial and important additions.

The main modifications in the treatment of Africa are confined to the southern portion; but recent developments in the Sudan and Nigeria are not omitted, and attention is directed to the commercial relations of Egypt with India in the past.

As regards South Africa, there is a general expansion of the historical notes, together with a broader treatment of the climatic conditions and of the character of railway communications, as determined by physical features. But, on the whole, there seems to be less change in this part of the book than in that dealing with Europe and Asia. The same may be said with regard to most of the American continent. The chief modifications have reference to Eastern Canada and the adjoining regions of the United States. The climate and mineral wealth are discussed at greater length, and a new map illustrates the coal and iron deposits of the whole area. On the economic side, there are notes on the currency and tariff history of the United States and the wider problem of the effect of tariff changes on British commerce.

In general, the author has confined his alterations to those regions in which recent economic changes have been most important, or which may, in the near future, be the scene of remarkable developments. Considerations of space must inevitably preclude any expansion of the work as a whole. In one direction the method adopted may be open to criticism, according to the ideas of the critic as to the limits to be observed by the geographer in dealing with economic questions. There is a considerable amount of purely economic discussion; at any rate, questions are dealt with which have no very definite reference to geographical principles. The economist may object that this constitutes an invasion of his special sphere, and, as a matter of construction, tends to overload the book with extraneous matter, thus obscuring the real geographical framework. Such criticism would apply more particularly to the mass of statistics in the appendix. Doubtless these, discreetly handled, may be useful for purposes of illustration; but the average reader is inclined to assume that the figures, as they stand, have a definite meaning, and may be used as a basis for argument. His conclusions are likely to be inaccurate, and may even distort his conception of those geographical principles which are a far safer basis for scientific argument than statistical abstracts in unskilled hands. A. J. S.

Hakluyt's Voyages.

'The Principal Navigations Traffiques and Discoveries of the English Nation. In Twelve Vols.' Vols. 1–4. Glasgow: MacLehose. 1903.

This excellent reprint places for the first time in the hands of students of the history of travel a handy working copy of the famous collection of Hakluyt. Such an edition has long been a desideratum, as the reprints hitherto issued had been far too cumbrous for convenience of study. It may be remembered that the Hakluyt Society, to which we might naturally have looked for the performance of this service, contemplated the issue of such a popular version a few years ago, and had actually made a beginning with the work, when, on the announcement of the present edition, it was, no doubt wisely, decided to discontinue the undertaking. However we may be inclined to regret that the work has not the support of the prestige and authority of the Hakluyt Society, it is certainly the case that Messrs. MacLehose's version admirably fulfils the purpose for which it was intended, viz. the placing within the reach of the general public the exact text of the great collection which occupies so unique a position as an authority on the early beginnings of British enterprise beyond the seas.

It is, of course, the second and more complete edition of 1598–1600, the text of which forms the bulk of the present issue. But in its modern form the work cannot be said to be simply a reprint of that edition, for its value to students has been enhanced by the addition of certain features from the original edition of

1589, *e.g.* the "Epistle Dedicatorie" and the original version of the voyage of Sir Jerome Bowes, while in regard to one or two small points modifications of the original have been introduced, and an interesting series of facsimiles, illustrating the history and cartography of the Elizabethan period, have been added. To some lovers of old books this may possibly seem an inadmissible tampering with the original, but of the practical utility of these features there can be no doubt. The deviations from the 1598–1600 edition consist in the recasting of the "Table" so as to bring together the "Voyages" and the explanatory documents (originally kept separate), and to harmonize it with the present division into twelve volumes; the printing of the three "Epistles Dedicatorie" together in the first volume; and the adoption of the modern use in regard to the letters *i*, *j*, *u*, and *v*. Otherwise the spelling of the original has been wisely retained, except in the case of obvious printer's errors.

In the selection of the illustrations, which has been done with much judgment, the publishers have had the advantage of the co-operation of Mr. B. H. Soulsby, secretary of the Hakluyt Society. Being intended as a representative collection of contemporary portraits and maps, they necessarily include items which have often been reproduced before, but some are taken from less accessible sources, and are thus made widely known for the first time. Among the most interesting in the volumes yet issued are (in addition to the two maps associated with the two original editions, and the title-pages of each of their four volumes), portraits of Sir H. Willoughby, Sebastian Cabot, Lord Burghley, Lord Howard of Effingham, the Earl of Essex, Sir Jerome Bowes, and others; pictures of the British and Spanish fleets in 1588 (including the Ark Royal, Lord Howard's flagship); and Burrough's chart of the Northern Ocean. All are reproduced in first-rate style.

THE MONTHLY RECORD.

EUROPE.

The Origin of the Term Maelstrom.—It is not perhaps widely recognized that the name in general use for the famous whirlpool off the western coast of Norway, does not appear to be indigenous to the locality, the name commonly applied to the whirlpool by the dwellers in its vicinity being Moskenstrom, or Moskoestrom, from the small island Moskoe near it. There is some uncertainty as to the precise way in which the better-known name first came into use, though, as we learn from Mr. H. Bradley, one of the editors of the 'New English Dictionary,' there seems to be no doubt of the Dutch origin of the word, the *ae* of the first syllable being the sixteenth-century equivalent of the modern Dutch *aa*. This is borne out by the fact that the first appearance of the name on a map seems to be in Mercator's Atlas of 1595, and that it was then only just coming into use seems shown by the employment by the same cartographer of the term Muskostrom in his earlier maps, *e.g.* in that of Europe of 1554, and in his famous world-map of 1569. The same name is used by J. Ziegler in his 'Schondia' (1532, etc.), and by Olaus Magnus (under the corrupted form Mostastrom) in his 'Historia de gentibus Septentrionalibus' (1555, etc.); while the latter, though marking the whirlpool in his map of 1539, here gives it no name, but inscribes the legend 'hic est horrenda Caribdis.' In literature, the name Maelstrom appears first, apparently, in Anthony Jenkinson's travels, as described by Hakluyt in 1589, though here it is corrupted to Malestrand, possibly from confusion with Marstrand in South Sweden, then a place of some note, and often written Malestrand. Jenkinson's use of the name may possibly antedate

the first of the Dutch voyages on this coast, though its publication by Hakluyt does not, for, as related in the introduction to the Hakluyt Society's second edition of Barents' Voyages, Dutch enterprise in the far north of Europe began at least as early as 1565, while Olivier Brunel's voyage, the first Arctic voyage proper undertaken by the Dutch, took place in 1584. There seems little doubt that the name became known to Mercator through these early Dutch voyages, and it is possible that careful search might reveal its use in literature before 1589. From 1595 onwards the name was constantly repeated in Dutch maps and atlases, including the map illustrating Barents' voyages, published by Cornelius Claeszoon in 1599, and reproduced in the Hakluyt Society edition of the Dutch navigator.

The Cartography of Sweden.—Dr. Sven Lönborg, of Upsala, has written a history of the cartography of his country ('Sveriges Karta tiden till omkring 1850'). He commences his record at the end of the sixteenth century, for before that date there was no one in Sweden who had the necessary astronomical and mathematical knowledge for the construction of maps. The first Swedish cartographer was Andreas Bureus, who was commissioned by Karl IX. to compile a map of Sweden. In the year 1611 he produced a map of Lapland, and in 1626 completed the first map of Sweden based on systematic investigation. Gustavus II. instituted a regular survey, and entrusted Bureus with the organization of the scheme and the training of the surveyors. The chief task of the surveyors was to draw up maps of all the villages and estates in the kingdom. These were on a large scale—often larger than 1 : 4000—and were accompanied by details concerning crops and live stock. Some years later maps of several districts were produced. Great strides were made in the eighties. Surveying parties were sent into one province after another, many provincial maps were compiled, and in 1688 a complete map of Sweden was prepared, which, though much superior to that of Bureus, showed many blanks in the surveys, and thus caused much important work to be executed. In old times Sweden was dependent on foreign publications for sea-charts and sailing directories, but now naval officers began to take soundings and bearings, and in 1695 Peter Gedda published a chart of the Baltic and the Belt. As regards the land-maps, no steps were taken for their publication, from military considerations. But at last, in 1698, Erik Dahlberg published an atlas consisting chiefly of copies of maps in the Survey Department. About 1730-40 the Department obtained permission to publish maps of the provinces, and in 1747 a general map of the kingdom appeared. New charts based on triangulation were first compiled in 1780 by Nordenankar, and the work was continued by Klint. A cartographical representation of the land, worthy to be placed beside these charts, was instituted by Baron Hermelin. In 1790 he began a series of maps of the Swedish provinces, which was completed in about twenty years, and was the basis of the Swedish portion of Forsell's map of Southern Scandinavia of 1826 (scale 1 : 5,000,000); but, whereas the vertical configuration of the country was represented on Hermelin's map only in a few exceptional cases, it was given on Forsell's map wherever the data could be obtained. Military cartography dates from 1805, when a military survey corps was formed, which in 1832 was made a separate department, and became the Topographical Department of the General Staff. Its maps, on the scale 1 : 100,000, were first made public in 1857.

The Population of the South of Hanover.—Dr. Eduard Wagner has investigated the density of population of the south of Hanover in connection with agriculture and other resources. It was his intention to have extended the area to the neighbourhood of the towns of Hanover and Brunswick, but the appearance of a work by W. Nedderich caused him to restrict his limits. He therefore has taken the Upper Harz nearly as far east as the Brocken, and the Triassic plateau

as far south as the valleys of the Leine and Wipper. In the west the valley of the Weser forms the boundary, and on the north the ancient highway now followed by the railway. Dr. Wagner discusses at considerable length the difficulties attending the representation of density of population on maps. For the map accompanying his essay he has chosen the method of Sprecher von Bernegg, based on the commune as a unit, but with bounding curves adjusted to the nature of the surface. He has eliminated certain great centres of population, but these are not selected by choosing some arbitrary maximum number of inhabitants. The towns are eliminated, whatever their actual population, when their inclusion would raise the density so much that the district would come under a higher division of the scale. The density of the whole country under consideration is 155 to the square kilomètre (about 402 to the square mile). Taking the round number 150, Dr. Wagner styles districts with a relative density of 80 to 150 well peopled, and divides the whole country into seven districts, with densities rising by 20 up to 100, and by 50 thence to 200. An eighth division includes all parts with a density above 200. The Upper Harz has a raw climate, and on the whole a soil unsuited for agriculture, especially corn cultivation. On the northern edge is a better soil, derived from the Jurassic and Cretaceous rocks; but industries predominate, and agriculture is more extensive on the southern edge in spite of a poorer soil. In the district of Zellerfeld, in which the greater part of the Upper Harz is included, more than 55 per cent. of the population gain their living by industries. Most of the towns and villages owe their existence to mines of lead, zinc, and copper. The road that runs from Bremen through Hanover to Goslar, and then turns aside to Halberstadt and Magdeburg, and the roads that run round the western side of the mountains, have also affected the distribution of population. Goslar, at the junction of the north Harz road with the Wolfenbüttel road, was a flourishing town till the Hansa league began to decline, and it was obliged to cede the silver-mines on the Rammelsberg to the dukes of Brunswick. Since the railway has been constructed it has begun to thrive again. On the Trias plateau agriculture slightly prevails over industry. The Keuper lands have a deep mould well suited for agriculture, though they have the disadvantage of an impervious subsoil. The Buntsandstein, when bound together with a siliceous cement, is not productive, but with a clay cement gives a fair return. There are also districts where this formation has been converted into loam, especially by the weathering of the upper beds. In those lands the imperviousness of the sub-soil makes the ground damp and cold, and during continued hot weather the surface dries up and cracks. A mixture of the clayey sandy soil with the loam is very fertile, and causes the density of population on the Goldene Aue and the Goldene Mark near Duderstadt. On the whole, the Buntsandstein is best adapted for forests. The Muschelkalk, which occupies only a small portion of the country, resists disintegration, and the area it covers is thinly peopled with a density not much over 50 to the square kilomètre. Industries have a most marked effect on the density in the Leine valley. Iron and soda, textiles, tobacco, and beet-sugar are the chief industrial products. All the causes that affect the distribution of population are discussed with great detail in Dr. Wagner's paper, and numerous statistics are given.

Earthquakes in Austria.—From the report of Hofrat E. von Mojsizovics, president of the Seismological Commission of the Imperial Academy of Sciences in Vienna, it appears that in 1902, a year so notable for earthquakes, the shocks in Austria numbered fewer than in preceding years, and that 1902 was indeed, seismically, the minimum year in a continuously lessening series. Thus in 1898 earthquakes in Austria were experienced on 209 days, in 1899 on 190, in 1900 on

169, in 1901 on 157, and in 1902 on 124 days. The diminution, however, be it observed, is concerned, not with the intensity, but only the frequency. The academy now keeps six seismological observatories—at Triest (Coastland), Laibach (Carniola), Kremsmünster (Upper Austria), and Lemberg (Galicia), besides the station in Vienna, furnished with a Vicentini vertical pendulum, which has recently come into operation; and, lastly, the double station at the state mine of Pribram (Bohemia), dating from 1902. This last is a surface station, which, by a cable, is connected with the subterranean station at the Adalbert shaft, 3600 feet deep. The scientific elaboration of the registers of this, the only existing double station, is in the hands of Privatdocent Dr. H. Bermdorf, of Vienna, who, with the assistance of Prof. Wiechert, of Göttingen, has directed the organization of the station.

The Tauern Tunnel.—An address by Prof. Friedrich Becke of Vienna includes some interesting particulars respecting the tunnel cut through the Central Alps, in connection with the second railway line in course of construction to connect the capital with Triest. "Tauern," it may be explained, is the dialectical equivalent of "Thore" (= English "doors"), or "Pässe." In the Hohe Tauern the antithesis between the central bed of gneiss and the casing of slate comes distinctly to view. The central gneiss is a cooled rock become schistose; the casing of slate is a manifold complex of rocks. The central gneiss has penetrated between the layers of the slate roof, and shattered them into blocks, probably without originally reaching the surface. It crops out in several detached bosses. One of them, the "Rathhauskern," is, to a length of 5·3 miles, pierced by the Tauern tunnel from its middle in the "Anlauftal" to its southern edge at Mallnitz. The tunnel will thus for the most part run in the central gneiss. At the south end it runs through a block of the slate casing. At the north entrance, on the other hand, about 920 feet of *débris* had to be broken through before the granite-gneiss with broad veins of mica was reached. On the south side were found scaly mica-schists and single layers of graphitic slates. It is still uncertain whether a continuation of the auriferous veins of the Rathausberg will be met with.

ASIA.

Books and Maps on Korea.—In our note on the literature of Korea in the February number, we limited our attention to recent works on that country There are, however, several earlier works which may also be read with advantage. Such are Mr. W. R. Carles' 'Life in Corea' (1888); Mr. W. E. Griffis' 'Corea: the Hermit Nation' (1882); 'A Forbidden Land: Voyages to the Corea,' by E. Oppert (1880); and 'Chosön, the Land of the Morning Calm,' by Percival Lowell (1885). Maps of the country have been brought out by the leading cartographical firms, and reference may also be made to the Korean sheet of the large-scale map of Eastern Asia, brought out by the French 'Service Géographique de l'Armée.' There is likewise a good map issued by the Japanese Government, but the names require to be translated before this can be useful to the general public. For the Korea-Manchurian borderlands Mr. Turley's map, given in the *Journal* for September, 1899, may be consulted.

AFRICA.

Survey of the White Nile in 1874.—Colonel C. M. Watson, R.E., C.M.G., a member of our Council, has lately presented to the Map-room of the Society the manuscript map of the traverse survey of the White Nile from Khartum to Rejaf, made by himself and Lieut. Chippendall, R.E., in the autumn of 1874, together

with the log-book giving detailed particulars of the survey. This most interesting and important map, a reduction of which was published in the *Journal* of the Society for the year 1876, is on the scale of 10 miles to 1 inch, and measures $6\frac{1}{4} \times 1\frac{3}{4}$ feet. It is extremely well drawn, and in addition to useful notes as to character of the adjacent country, width of the river at different points, and bearings, it contains many small outline sketches, and two most useful tables. One of these consists of a list of the meteorological observations taken on the journey, and the other gives the latitudes and longitudes of places below Fashoda, which were astronomically determined. Having received instructions to join the late General (then Colonel) C. Gordon on the upper Nile, Colonel Watson, who was at that time a lieutenant, left Suez, in the company of Lieut. Chippendall, R.E., on August 31, 1874, and, after crossing overland from Suakin to Berber, eventually arrived at Khartum. There he remained a few days, and then proceeded by steamer up the White Nile to Gondokoro, which place was reached in thirty-four days. It was during this journey up the river, which was then at high water, that this survey was made. The windings of the river were determined by a 4-inch prismatic compass, which had been suitably fixed in the boat, and the traverse was plotted day by day in the log-book which accompanies the map. Distances were laid down by a time scale from the rate of steaming, and were checked by the positions of as many places as possible being obtained by astronomical observations, the principal instrument used for this purpose being an 8-inch sextant reading to ten seconds. Altogether the survey was most satisfactorily and creditably carried out, and for a long time formed the basis of all maps of this region. Even now, notwithstanding more recent surveys, it is of considerable importance. As an example of survey work of this character, it deserves the serious attention of explorers who are about to undertake a river traverse in any little-known region, and in this respect will be of special value in our collection. The log-book, which is full of most important information, is, in the manner in which it has been kept, a pattern of thoroughness and neatness.

North-Eastern Rhodesia.—The Report on the administration of North-Eastern Rhodesia for the year ending March 31, 1903, gives on the whole a favourable account of affairs in the territory, although little industrial and commercial development is reported for this period. The country is said to be peaceful, and the attitude of the natives towards the administration continues satisfactory. Native regulations, founded on those in force in Southern Rhodesia, have been generally adopted during the year. The total native population is estimated at 345,961, and the number of European residents in the country on March 31, 1903, was 241, an increase of 53 on the number at the same date of the previous year. Large deposits of copper, lead, and zinc ores have been discovered, particularly to the south-west between the Luangwa and the Kafue, all of them being ancient workings, upon which development work is being carried on. The whole of the country along the southern border of North-Eastern Rhodesia appears to be highly mineralized. The total number of cattle in the country on March 31, 1903, is given as 7376, or an increase of 2409 head over the number on the same date in the previous year, this increase being partly due to importations from German East Africa. The country in the vicinity of Fort Jameson appears to be admirably adapted for cattle-raising. Much damage seems to have been wrought by rubber traders in North-Eastern Rhodesia before attention could be given to the protection of the vines, but since 1902 regulations have been enforced, with the result that the vines in many districts are showing signs of recovery. The figures both for expenditure and revenue show an increase over those of the previous year, the former being principally accounted for by the establishment of the High Court and Survey

Department, and the latter by increased receipts from hut-tax, export duties, land sales, and quit-rents. The recently organized Survey Department will endeavour shortly to complete the plane-table survey of the boundary between North-Eastern Rhodesia and the British Central Africa Protectorate from Fort Jameson northwards. Although blackwater fever again figures prominently as a cause of fatality, and malarial fever has occurred with the usual frequency, a slight improvement in the public health of North-Eastern Rhodesia during the year is reported, the improved health of the larger stations being again very marked.

Mining in Natal.—The recently issued Blue Book shows that down to the close of 1902 mining in Natal has not yet recovered its normal conditions. Three new collieries were in that year opened, yielding 9762 tons. Owing, however, to reduced demand for coal at the port, the output decreased in the closing months of the year, and the price fell. Though, therefore, the output for 1902, 592,821 tons, exceeded that of 1901 by 23,622 tons, the estimated value at the mine was in 1902 £36,865 less than in 1901. The gold output was 78 ozs. The Mines Commissioner found no signs of either coal or gold deposits in the Ingwavuma district. The formations of the Lebombo range are fossiliferous rocks, probably of Cretaceous age, containing, with other fossils, ammonites like those found near the mouth of the Umtamvuna river; calcareous sandstone, like that of the Durban Bluff; partially consolidated sand, probably of littoral origin; surface deposits of shingle, mostly quartz and quartzites, with some apparently Cretaceous fossils, seemingly of fluviatile origin. Whether coal-measures lie underneath these formations has not yet been determined. In Vryheid and Utrecht districts the coal-measures are found in the ridges and mountains forming the watersheds between the principal rivers, the coal-seams lying, as a rule, at about 4000 feet above sea-level. The area of ground likely to be underlaid by coal-seams in these two districts is roughly calculated at 500 square miles, but no estimate is attempted of the amount of workable coal. The most important working is that on the town lands of Utrecht, from which the town has been supplied with coal. The seam is worked from an adit in the side of a steep hill.

Northern Nigeria.—Sir F. D. Lugard's Report on Northern Nigeria for 1902 (Colonial Reports, Annual No. 409), covering 114 pages, deals largely with the political history of the protectorate, the events in connection with the Kano-Sokoto campaign in the beginning of last year being fully treated. As Sir F. Lugard has so recently (November 4 last) addressed the Society on the subject of Northern Nigeria, we need only refer to one or two matters dealt with in the Report. The subject of railway extension in the protectorate receives due attention. One project is to extend the existing light surface line between Zungeru and Bari Juko to the Niger at Baro, which would place Zungeru within eighteen hours of Lokoja, and greatly facilitate the transport of stores, etc., and would, moreover, traverse the greatest trade route in Nigeria. Alternative routes the whole way from Zungeru to Zaria have also been examined and roughly surveyed, and a feasible track for the ultimate extension of this surface line has been found. Work in connection with the delimitation of the frontier is in progress. The Anglo-French Commission has been engaged in the delimitation of the north-western and northern boundary from the Niger to Chad, from the point reached in 1900, describing an arc around Sokoto (radius 100 miles); while the Anglo-German Commission is delimiting the frontier from Yola to Chad. The telegraph system has been extended during the period under review. The total mileage of telegraphs in the protectorate is given as 657. The several provinces of the protectorate are separately referred to, while a section is devoted to the prospects of trade in the newly incorporated northern states. The Report contains a map of Northern

Nigeria on a scale of 1 : 2,000,000 (approximately 32 miles to 1 inch), brought up to date, and a plan of Kano.

AMERICA.

Work of the Canadian Geological Survey.—Among the mass of valuable information contained in the summary report of this department for 1902, perhaps the most interesting items from a geographical point of view are the accounts of explorations on the Macmillan river (Yukon basin), by Mr. R. G. McConnell, and of certain rivers entering James bay from the west, by Mr. W. J. Wilson. There is also an interesting report on the climate and flora of Dawson, by Prof. J. Macoun. The Macmillan, one of the principal feeders of the Pelly, rises by two main branches in the Selwyn mountains, and has a total length of about 285 miles. The main river, which is generally navigable by small steamers, flows in a valley from 1 to 2 miles wide, covered with a heavy deposit of clays, sands, gravels, etc., into which the river has cut a great trench. Of the two forks, the northern (an exceedingly rapid stream) carries a much larger volume of water. Along the main stream, and for some distance up the two forks, there is fairly luxuriant forest, the white spruce being the principal tree. The mountains, mountain groups, and broken uplands which make up the region are the surviving fragments of an extensive highland, the major portion of which has been destroyed by sub-aërial denudation and erosion. The Selwyn range differs from the main range of the Rockies further south in consisting of a number of irregular groups of mountains, and not of a series of longitudinal ridges, this being largely due to the presence of granite masses. The rocks along the main river seem to consist, on the one hand, of argillites, quartz-schists, quartzites, and limestones, and on the other, of volcanic fragmental rocks, interbanded with and overlain by cherts and argillites. During the Glacial epoch a glacier descended the valley, and continued down the Pelly to about 20 miles above Fort Selkirk, varying in thickness from 3300 to 2000 feet. The highest peaks, however, show no evidence of a continuous ice-sheet. Prof. Macoun shows the climate of the Yukon in a much more favourable light than has sometimes been the case. Remarkable facts are mentioned in regard to the rapid growth of vegetation during the summer months, and, with the possible exception of wheat, the climate is said to be very favourable for agriculture, barley especially doing well. Prof. Macoun attributes this to the effect of the coast range, which condenses the moisture from the ocean, and causes the air to descend on the Yukon plain with increased dryness and warmth. The snowfall is light and the spring early, the dry and warm summer being fairly under way early in May. The frost in the soil is beneficial, as it retains the moisture in the surface layers, keeping the roots of plants well supplied. Prof. Macoun therefore predicts "a great future for the Yukon district as a producer of everything needed to support a very large population," for even wheat, he holds, will soon adapt itself to the conditions and ripen early. The rivers examined by Mr. Wilson and his assistant were the Kapiskau, which enters James bay a little north of Fort Albany, and various branches of the Albany and Moose rivers. A survey was also made of a portion of the shore of James bay. The most striking characteristic of the coast region is its extreme flatness, and this continues for 175 miles up the Kapiskau. For 125 miles the banks are composed of clay, with boulders and sand. The river has no distinct valley, but has cut its way into the thick clay, while the land immediately along its banks has been raised by the deposition of sediment, forming wooded ridges. Further inland a soft argillaceous limestone appears. Large areas are covered by peat-bogs. The formations principally represented are the Middle Devonian and Laurentian. During July and

August the weather was usually fine, with warm days and cool nights; but thunderstorms preceded by violent gales were rather frequent.

AUSTRALASIA AND PACIFIC ISLANDS.

Geological History of Tasmania.—During a recent visit to North-Western Tasmania, Prof. J. W. Gregory paid some attention to the past history of the island from the point of view of physical geology, and his conclusions are summarized in a paper printed in the *Proceedings* of the Royal Society of Victoria (vol. xvi., N.S., part i.). His views as to the former glaciation of the island were put before the Geological Society of London at its meeting of December 2 last. In the former paper the author describes the series of peneplains which occupy a large part of North-Western Tasmania, west and north of the West Coast range. A part at least of this area had previously been taken for a plain of marine denudation, but the general views of its surface obtained by Prof. Gregory from points of vantage left no doubt in his mind that it had originally been formed by river action, which, at a subsequent period, has deeply dissected its surface. The peneplain of the Hentz river, to which special attention was directed, must have been formed when Tasmania stood at a lower level than at present, and may have been contemporary with the dissected peneplains of Victoria. It owed its origin to a pre-glacial river, and some glacial deposits occur in valleys cut through it, but the date of its uplift is nevertheless geologically recent. It is shown that the King river has not always flowed in its present course, but that to it must be due the formation of the deep valley between Mounts Lyell and Sedgwick, which is in direct continuation of the branch of King river which drains the southern slope of the Eldon range. This former course must have been obstructed, possibly by glacial deposits, and the river in time found a new outlet by its present canyon, the narrowness of which shows it to be a very young valley. Further evidence indicating a comparatively recent uplift of this part of Tasmania is supplied by the southern face of Mount Sorell, across which a well-marked beach-line runs. In his communication to the Geological Society, Prof. Gregory showed that the latest or pleistocene glaciation extended in one place down to 400 feet above sea-level, and that many of the deposits are little more altered than those of northern England. In the discussion which followed the paper, Mr. P. F. Kendall remarked that the phenomena indicated glaciation by ice-sheets, not by valley glaciers, and that the low level reached by it in a latitude corresponding to that of Madrid was very remarkable.

POLAR REGIONS.

The Argentine Expedition for the Relief of Dr. Nordenskiöld.—The *Boletin del Centro Naval* of Buenos Aires for November-December, 1903, contains an account of the proceedings which took place on the return of the *Uruguay*, together with the report of Commander Irizar and Dr. Nordenskiöld's paper on the results of his expedition. Various complimentary speeches were made, including one by the Minister of Marine, which contains the following appreciative remarks on the help afforded to Commander Irizar in this country during the organization of the expedition: "On my part, I ought to extend the reference to the efficient equipment of the *Uruguay* to the worthy President of the Geographical Society of London, for the important aid he extended to Lieut. Irizar in the ordering of provisions and essential articles to be obtained in Europe, with the desire that our expedition might be, as it certainly has been, as well furnished as the best of similar expeditions up to the present time." Sir Clements

Markham wishes it to be understood that the greatest help was gladly rendered to Commander Irizar by Messrs. Shackleton, Longhurst, and Somerville.

The Eskimo Exodus.—Prof. A. Faustini, in the *Rivista di Fisica* of Pavia, treats of the wanderings of this people across the Arctic lands of North America. He adheres to the more prevalent opinion that the Eskimo migrated from Asia, and does not believe, as some ethnologists have asserted, that they spread eastwards and westwards from some part of America, nor, as Nordenskiöld suggested, that the Eskimo of Asia and America sprang from different stocks. In the *Proceedings of the R.G.S.*, vol. xxxv., Sir Clements Markham traced the Eskimo to Baffin bay, across which the Arctic highlanders of Ross may have passed to the neighbourhood of Inglefield gulf, and Prof. Faustini completes the record of their migrations by collecting notices of ruined igloos and other remains from the writings of recent explorers. The Nares expedition found no traces of Eskimo north of Cape Beechey, the most eastern point of Grant Land, and only 13 nautical miles from the coast of Greenland. On the opposite side of Robeson channel Captain Hall, of the *Polaris*, found many remains of summer encampments, and thence the presence of Eskimo may be traced southwards to the Humboldt glacier, which seems to have barred their way. Prof. Faustini inclines to the opinion of Feilden, De Bizemont, and Sabine, that this branch of the migratory stream then passed across the inland ice to the east coast of Greenland, and that the Eskimo met with by Sabine and Clavering on that coast had arrived there by the northern route, and not round Cape Farewell. Certainly the remains found there are of great antiquity, and about contemporaneous with those reported from the west coast between Cape York and Dallas bay. The question has still to be answered whether the Eskimo of the west coast crossed directly from Ellesmere Land or some neighbouring coast, or whether they are the vanguard of a stream of migration which passed round Cape Farewell. It is significant that the remains on the Greenland coast are of about the same age as those on the opposite shores of Baffin bay, while they are decidedly more recent than those at Beechey cape and Offley island.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Asymmetry of Valleys.—In an instructive article in *La Géographie* for November last, Mr. F. A. Fabre sums up the results of recent research on the frequent characteristic of valleys to be asymmetrical as regards the profiles of their opposite sides; presenting, also, the results of personal observations on the valleys of Gascony, where the phenomenon is particularly well marked. M. Fabre begins by quoting the views of the French hydrographical engineer, De Lamblardie, who, writing in 1789, showed that, in the case of valleys running at right angles to the direction of rain-bearing winds, the side exposed to such winds is always the steeper. The subsequent enunciation of "Baer's law" as influencing the movements of rivers turned the attention of observers in another direction, and it is only of late years that the general belief in the effectiveness of that law has begun to be shaken, Penck having materially contributed to this result in his 'Morphologie der Erdoberflache.' M. Fabre's studies in the region north of the Pyrenees, undertaken in conjunction with M. Marchand, led him to decide against the effectiveness of Baer's law, and to adopt conclusions similar to those of De Lamblardie. The region studied is subject, on the one hand, to the action of the torrents descending from the Pyrenees, which furrow the plateaux ranged in front of the chain, and on the other, to that of the rain-bearing winds from the north-west; and examples of asymmetrical valleys abound, these being *directly* asymmetrical (*i.e.* with

the steep side opposed to the winds) in the case of marls, clays, and other strata capable of some resistance, but *inversely* so when they cut through more friable soils. Where valleys run at right angles to the direction of the prevailing wind, it is shown that the amount of rain falling on to the two versants may be very different. The conditions leading to direct asymmetry are enumerated thus: (1) Exposure of one side to such excess of atmospheric action; (2) exaggeration of the surface scouring on this side; (3) the pushing forward of detritus by the lateral torrents on the gradual slope, where erosion is more localized, the main stream being thus forced against the opposite side of the valley; (4) undercutting of the base of the side attacked; and, lastly the blocking of the *thalweg* by the more solid portions of the detritus, which forces the sand-charged water laterally against the side attacked. The last-named would seem to be hardly a condition distinct from the rest, for unless it be merely the third of the series under another designation, it does not appear why the one versant should suffer more than the other from this action. Again, while the action of the lateral torrents must no doubt account for much when the asymmetry has once been established, it is not made clear in what way it begins to be operative in the case of a valley originally symmetrical. M. Fabre allows that geological causes have their influence side by side with these geographical ones, and it may be thought that he hardly gives to the former their due weight. The latter part of the paper is taken up with a detailed review of the asymmetrical valleys of Gascony and elsewhere, many of the instances being taken from European Russia, and in all cases it is held that the facts admit of possible explanation without the intervention of Baer's law.

GENERAL.

The Eighth International Geographical Congress.—A second circular has been issued by the committee at Washington, giving further information as to the arrangements so far made for the holding of this congress. The main points of the first circular were summarized in the *Journal* for September last (vol. xxii. p. 312), so that it will suffice here to mention one or two additional arrangements, or alterations in those previously made. Meeting at Washington on September 8 of this year, the Congress will hold sessions in that city on the 9th and 10th, but will leave on the 12th for New York (being entertained during that day by the Geographical Society of Philadelphia), and will hold scientific sessions at New York on the 13th, 14th, and 15th, on which days the entertainers will be the American Geographical Society. On the 16th the Niagara Falls will be visited, and on the 17th the members will be entertained by the Geographical Society of Chicago, and on the 19th and 20th will have the opportunity of taking part in the International Congress of Arts and Science connected with the World's Fair in St. Louis. The arrangements for the Far-West excursion (on which it may be necessary to limit the number of participants) are as previously announced. It is hoped that special reduced rates may be arranged for this, as well as for the passage of foreign members from one or more European ports to New York. Final information on these points will be given in June. It is now stated that all communications designed for printing in connection with the Congress must be received at Washington not later than June 1, and any abstract of communications (limited to 300 words) for insertion in the general programme, not later than August 1.

Geographical Education: Conference and Exhibition.—A conference on the teaching of geography was held in January at the Chelsea Polytechnic, under the joint auspices of the Geographical Association and the Technical Educational

Board of the London Council. Mr. Mackinder spoke on geographical teaching as a continuation of nature study, claiming that the function of geography in education was to train the imagination and give the pupil the power to look out on space. He insisted that the elements of geography had a scientific, an artistic and also a philosophical aspect. Prof. P. F. Kendall discussed the making and use of models, showing how, by cutting out horizontal pieces of cardboard and filling up the interstices between each plane, it was possible to obtain a model showing the true slopes. Mr. J. Lomas contributed an account of some excursions he had made in the Liverpool district, his experience tending to show that they are both practicable and profitable. Dr. Herbertson discussed the use to which the sheets of one-inch and other large-scale maps of both the home and foreign governments could be put in teaching, not merely physical, but also historical geography; while Mr. T. Alford Smith furnished an instructive demonstration of the value of the use of the globe in teaching geography.* In connection with this conference, the Geographical Association got together a large number of specimens of maps, atlases, text-books, pictures, lantern slides, and other appliances for teaching geography, the exhibits filling a large hall and a lecture room. Among the maps exhibited, special mention may be made of a fine set of orographical wall maps which included examples of the productions of the best makers; physical maps of Europe by Bamberg, Debes, Johnston, Kiepert, Mackinder (Stanford), Philip, and Habenicht; and one of Asia on the Heiderich system, a comparison of different styles of workmanship being thus permitted. There were also political wall maps and typical pictures of landscapes and peoples. The possibility of making wall maps by buying a few sheets of the half-inch contoured map of Great Britain by Bartholomew was proved by the very effective map of England south of the Thames, lent by the London School of Economics. In the section devoted to the British Isles (of which, it may be noted, really first-class orographical wall maps are wanting), the 10-miles-to-the-inch maps of Scotland—orographical, geological, and vegetation—published by Bartholomew, with his beautiful geological map of England and Wales on the same scale, formed a striking series. The Board of Agriculture sent a number of small maps illustrative of the distribution of live stock and cereals in Great Britain, and the Geological Survey, maps illustrative of different types of scenery, and sheets of the topographical map. Specimens of Ordnance Survey sheets were shown by the Southampton Geographical Society, and large-scale maps were exhibited by the Austrian, Bavarian, Belgian, Indian, and Swedish Governments. The fine exhibit sent by the India Office contained geological, climatic, and economic, in addition to the ordinary topographical maps; while the Meteorological Office lent a most useful collection of weather charts of all nations. The number of school books and school atlases was large and representative. A collection of models was shown, of which, perhaps, that of Ingleborough, by Prof. Kendall, of Leeds, and the model on a true scale of part of the Eastern Alps, by Prof. Dinges, of Mindelheim, were the most effective. Lastly, mention must be made of a collection of slides for graphic illustration, and of the maps for class use by the Diagram Company and by Darbishire and Stanford, of Oxford.

The Russian Geographical Society.—The Report of this Society for the year 1902 makes mention of several very interesting expeditions. M. Tsybikoff's journey to Lhasa has already been mentioned in the *Journal*. V. L. Komaroff

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* Prof. Kendall's and Mr. Lomas's communications are printed in the *Geographical Teacher* for February, and the others will appear in a subsequent number.

made an excursion into the region in the upper parts of the Oka, on the Chinese frontier, which had not been revisited since Kropotkin's excursion in 1865, and found there extensive morainic deposits, as also large extension of lavas in the Sayans. Prof. Sapozhnikoff explored the steppes round Lake Balkhash, the Eastern Tian-shan, and the Jungarian Alatau. Several expeditions have worked in European Russia itself, exploring Kolgueff island, making pendulum measurements on the lower Volga, etc. The same Report supplies a long-felt need by embodying the reports of the different branches: Caucasian, West Siberian, Orenburg, Turkestan, Amur (with its three sub-branches, Troitskosawsk-Kiakhta Chita, and Vladivostok), and East-Siberia, with its Kraznoyarsk sub-branch. Most of these branches having published no reports for the last few years, the arrears are now cleared off, and a mass of interesting matter is th s given. In the Caucasus, the main work was directed towards the exploration of the northern Caucasus and its glaciers, which are yet far from being all mapped. It is known that all over the Caucasus traces of a wide glaciation have been found; but it appears now, from the exploration by V. V. Markovitch of the Vaza-khokh glaciers, that not only did the glaciers of the main range flow through the gorges of the Peredovoi Khrebet (the range which runs in the north of the Main Range, parallel to it), spreading next on the high plains, but that the Peredovoi range was also glaciated. Two other very interesting works are being carried on by members of this Caucasian branch: namely, a map of northern Caucasia, delimitating the territories which were occupied by the different mountaineers before their forced emigration to Turkey in 1862–1864, and a translation of the 'Geography of Georgia,' by the Prince V. Fahushti. The West-Siberian branch was engaged chiefly in the study of the Altai, joining for this purpose the Altai Society, and in the exploration of the salt lakes of the Omsk region. The twenty-eighth volume of its Memoirs contains papers by MM. Berg, Ignatoff, and several others on the salt lakes of the district of Omsk, their algæ, and their fauna; also on the flora and the mineralogy of the same region. We notice, also, the appearance of a work, in three volumes, by V. Dolgorukoff, 'The Highlands of the Altai and their Population.' The Orenburg branch has taken part in a very useful work, namely, the levelling of the southern Urals, in connection with the geodetic triangulation of 1869–1873. Its *Izvestia* (part 16) contain, besides a report on this work, several papers on the meteorology of the region, the geology of Iletsk, an historical sketch of the Turgai region, a paper on the Kirghiz, etc. The Turkestan branch concentrated its attention chiefly on the Aral expedition, which is the subject of a special note. The two Transbaikalian branches have enriched their museums with collections of plants, as well as of geological, anthropological, and economical specimens, and the Chita branch intends publishing a very valuable geological map of the Vitim, by I. M. Buivid. The well-known botanist, A. K. Kuznetsoff, has made most interesting researches on the value of the valley of the middle Vitim for agricultural colonization, and has brought together valuable collections, both anthropological and botanical.

OBITUARY.

Sophus Ruge (1831–1903).

We regret to announce that Prof. Sophus Ruge, the eminent German geographer, died at Dresden on December 23, 1903, only five weeks after the death of his wife.

Sophus Ruge was born at Dorum, a small town in the "marshland" of Wursten, in Hanoverian Friesland, on March 26, 1831. His father was a physician, who could boast of having been present at the battle of Waterloo. After his death the family removed to Stade, where young Ruge passed through the gymnasium, and whence, in 1850, he proceeded to the University of Göttingen as a student of theology. On the completion of his university course, in 1857, the young *cand. theol.*, like many of his comrades in Germany, sought occupation as a teacher. He found a situation as *Hauslehrer* at a lonely forester's house at Selzerturm, near Eimbeck, and the leisure enjoyed by him during that engagement was employed in the study of geography, which had at all times been a favourite subject with him, even during his schoolboy days. After a temporary employment as one of the teachers at a girl's college at Stade (1857–9), he proceeded to Dresden, and remained there for the remainder of his life, first as a teacher in a commercial school, and latterly, since 1874, as *Professor ordinarius* of geography and ethnography at the Polytechnicum.

His experience as a teacher enabled Ruge to write two excellent school-books, namely, a 'Kleine Geographie für die unteren Lehrstufen (Leipzig, 1877, 6th edit. 1900), and a more advanced 'Geographie für Handels- und Realschulen' (Leipzig, 1884, 14th edit. 1904). His ideas on the relations between geography and the kindred sciences he laid down in an essay on 'Das Verhältniss der Erdkunde zu den verwandten Wissenschaften (Dresden, 1873).

But Ruge's reputation depends mainly on his labours in connection with the history of geography. In 1868 appeared his paper "Ueber Compass und Compass Karten" (Dresden). In 1877 he prepared a second edition of Peschel's 'Geschichte der Erdkunde;' and in 1881 he published a 'Geschichte des Zeitalters der Entdeckungen' (Berlin), a work of much erudition and of great authority. In 1888 he issued collectively twelve *Abhandlungen und Vorträge zur Geschichte der Erdkunde* (Dresden), most of which had been read before the Dresden Geographical Society, one of the founders of which he had been. The fourth centenary of the discovery of America, in 1892, was signalized by Ruge by a 'Life of Columbus' (2nd edit., Berlin, 1902), an historical essay on the cartography of America published as a supplement of *Petermanns Mitteilungen*, and a paper on the discovery of the new world in the *Festschrift* of the Hamburg Geographical Society. Ruge likewise furnished the article on cartography in the *Encyclopædia Britannica*, and students of geography are greatly indebted to him for his bibliographical reports in Wagner's *Jahrbuch*. At the time of his death Ruge was engaged on a critical study of Portuguese discoveries along the west coast of Africa, the first instalment of which appeared in the *Abhandlungen* of the Saxon Academy of Sciences.

Ruge leaves behind him one daughter and two sons. One of the sons is a staff surgeon in the German navy; the other, Walter, born in 1865, has done some good work as an explorer in Asia Minor (*see Petermanns Mitteilungen*, 1892).

E. G. R.

CORRESPONDENCE.

The Roads to Tibet.

In Mr. Freshfield's paper in the *Geographical Journal* for January last, no allusion is made to a route which I described in a paper read before the British Association at the Bath meeting in 1888—a route which then seemed to me, so far as I knew it, to be by far the shortest and easiest of all the routes which pass from Bengal to Central Tibet.

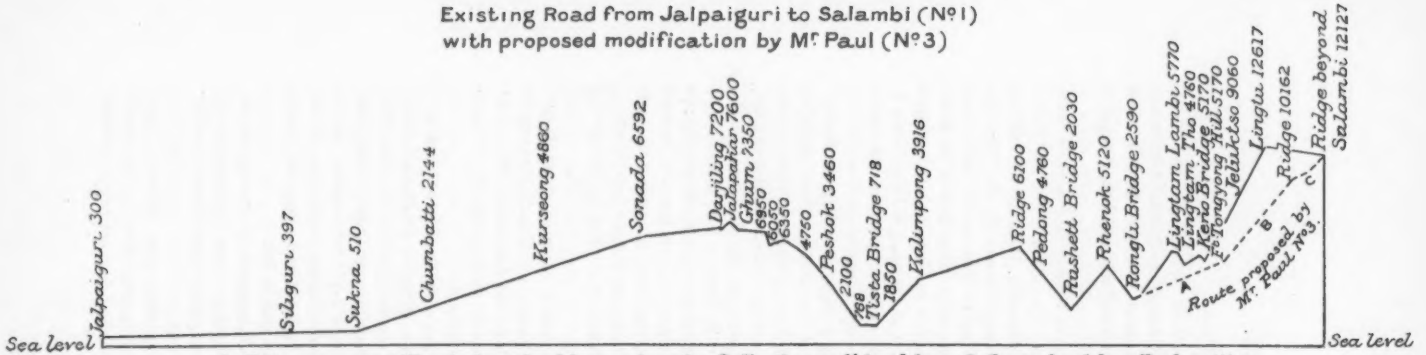
I believe that I was the first European to visit the Jelepla in company with Mr. W. T. Blanford, F.R.S., in 1870 (Cf. *Journ. As. Soc. Bengal*, vol. xl. Pt. ii., 1871). After the mission to Lhasa, organized by the late Mr. Macaulay in 1886, of which I was a member, was withdrawn, I made an expedition with Mr. Prestage, C.E., then on the staff of the Darjeeling railway, to try to discover an easier road to Chumbi, in case that, as it turned out, a military expedition had to be made there. Starting from Laba, a place in British Bhotan at an elevation of 6600 feet, and only about 18 miles from Bulabari in the Duars, to which, I believe, there is now a light railway from Jelpaigori, we ascended along a spur through dense forest to Pankasari, 8100 feet, in about 7 miles: here there is good water and camping-ground. From here a gradual ascent along a ridge, with only some slight ascents and descents, which could be easily avoided by cutting a new path (we had to follow an elephant path most of the way), led us in about 9 miles to the top of Rishilah, about 10,300 feet. Here there is a large extent of open ground, mostly covered by scrubby jungle, with plenty of pasturage for sheep and cattle. From this point the route has been surveyed by Mr. T. Roberts, who went over it in 1885, and leads along a ridge with some ascents and descents to Padonglah, or Pangolah, 10,600 feet in about 10 miles. Here there is open camping-ground surrounded by forest. From here to Singidom (not marked on my map) is an easy march of about 6 miles along an undulating ridge to Nathong or Salambi, about 10 miles, which has a steep ascent (impassable at that time for ponies) up the shoulder of Lingtu.

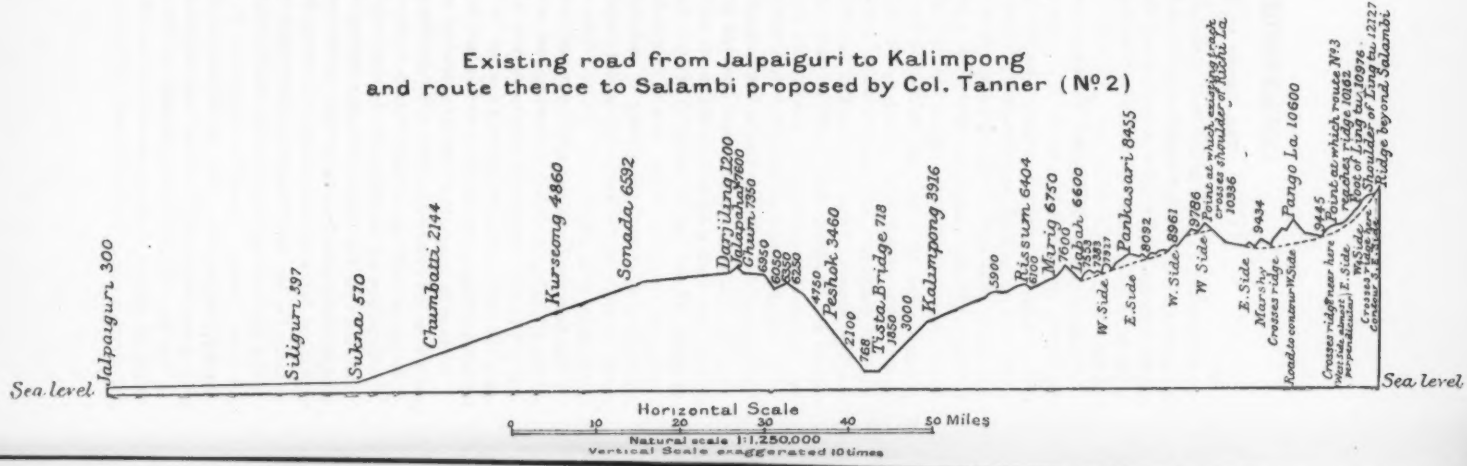
The expense of making a good pony road from Labah to Salambi was estimated by Mr. Nightingale, then executive engineer at Darjeeling, at about 20,000 rupees only. The total distance by this route from Labah to the Jeleplah is thus only about 54 miles, without any long descents or rivers to bridge, and the saving in ascents over the route now taken is from 10,000 to 12,000 feet.

It must be remembered that the cart road now in use up the Tista valley is on account of the great heat of the valley and the absence of fodder for draught cattle or mules, as well as its unhealthiness during the greater part of the year, very trying to those accustomed to the dry and cool climate of the Chumbi valley and Tibet, and that the nearer a frontier trading station or depôt for supplies can be brought to the plains, at an elevation which is tolerable for the inhabitants of the highlands for which the country between the Rishilah and Pangolah seems suitable, the less the objections to the existing routes will be felt.

If a light railway was extended from Bulabari to Jungiguard, at the foot of the hill below Labah, it would be easy to go in three days from Calcutta to the Jeleplah, and the route, when opened out and cleared, would provide much better grazing for cattle and pack-mules than the existing one.

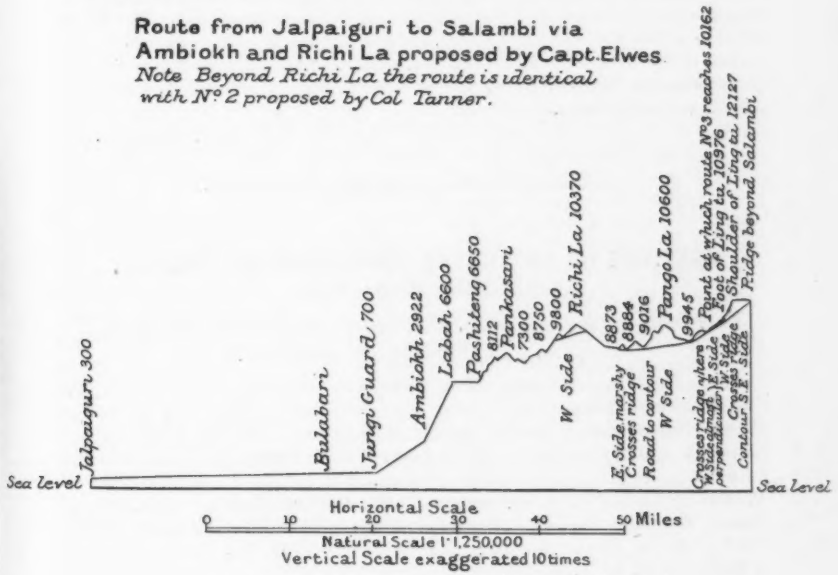
The late Colonel Tanner proposed an alternative route from Kalimpoong to Labah, of which a section is shown in the accompanying plan, showing the ascents and descents which have to be made by the three routes. It must be remembered


Existing Road from Jalpaiguri to Salambi (No 1)
with proposed modification by Mr Paul (No 3)
Sea level
Jalpaiguri 300
Siliguri 397
Sukna 510
Chumbatti 2144
Kurseong 4860
Sonada 6592
Darjiling 7200
Jalapahar 7600
Ghum 7350
6950
6050
6350
4750
Peshok 3460
2100
768
Tista Bridge 718
1850
Kalimpong 3916
Ridge 6100
Pedong 4760
Rasheti Bridge 2030
Rhenok 5120
Rongli Bridge 2590
Lingtam Lamby 5770
Lingtam Tho 4780
Kero Bridge 5170
Yongyong Hill 5170
Jelukelso 9060
Linglu 12617
Ridge 10162
Ridge beyond
Salambi 12127
A
B
C
Route proposed by
Mr Paul No 3.
Sea level
A Follows course of Pongli, large boulders and earth, B Earth, small boulders. C. Large boulders, Rock cutting


Existing road from Jalpaiguri to Kalimpong
and route thence to Salambi proposed by Col. Tanner (No 2)
Sea level
Jalpaiguri 300
Siliguri 397
Sukna 510
Chumbatti 2144
Kurseong 4860
Sonada 6592
Darjiling 7200
Jalapahar 7600
Ghum 7350
6950
6050
6350
4750
Peshok 3460
2100
768
Tista Bridge 718
1850
3000
Kalimpong 3916
5900
Rissum 6404
6100
Mirig 6750
7600
Algarah 6600
7355
7337
W. Side
E. Side
Pankasari 8455
8092
W. Side 8961
W Side 9786
Point at which road crosses shoulder of Kabru La 10336
E. Side
Marshy
Crosses ridge
Road to enter W. Side
9434
Pango La 10600
9445
Crosses ridge near here
W. Side almost perpendicular
E. Side
W. Side
Crosses Ridge here
Crosses at this point
Point at which route No 3 reaches ridge 10145
Foot of Ling tu 10976
Shoulder of Ling tu 12127
Ridge beyond Salambi
Sea level
Horizontal Scale
0 10 20 30 40 50 Miles
Natural scale 1:1,250,000
Vertical Scale exaggerated 10 times

that when this plan was drawn in 1887, the cart-road up the Tista valley had not been made, and all traffic had to go round by Darjiling.

With regard to the prospects of trade with Tibet, I quite agree with Mr. Freshfield, that they have been underestimated by most writers. The Tibetans want two things, viz. tea and cloth, that we can supply them with much better and cheaper than they now get them. They can supply us with two things which Bengal cannot produce, of good quality, viz. wool and mutton. The samples of Tibetan wool which I brought home and showed at a meeting in Bradford in 1887 were considered by the merchants there equal to Cheviot wool. I have a blanket made from it, which, after thirty-three years of hard wear on many camping-trips, is still as good as when made, and if flocks of Tibetan sheep were driven down



to Labah and killed there, the mutton, of excellent quality, might be in Calcutta twenty-four hours later.

From what I saw in 1870 and in 1886, and from what I have heard since, I have no doubt that the Tibetan people, as distinguished from the lamas, who now have a practical monopoly of trade in Tibet, would welcome free intercourse; and, as there is no other known point in the whole range of the Himalaya where the passage from Tibet to India is so short and so easy, and where the dry climate of the highlands comes so close to the plains, as in the Chumbi valley, I look forward to this route becoming in the not very distant future one of the great trade routes of the world.

H. J. ELWES.

Sadiya, *viâ* Dibrugarh, January 30, 1904.

I have just read Mr. Douglas W. Freshfield's "The Roads to Tibet," published in vol. xxiii., No. 1, of the *Royal Geographical Journal* for January, 1904, and with reference to the following paragraph at p. 79, viz. "The frontiers meet in the far east, where the Brahmaputra breaks out of the mountains through narrow valleys of which their wild inhabitants still preserve the mystery," beg to point out that this statement is quite incorrect. Mr. Freshfield is evidently not aware that I marched right through these supposed "wild inhabitants" in [1885 *], when I visited Rima, and was everywhere well received and treated by them! The Mijus, who border on Tibet, due east of Sadiya, are in no sense a "wild" tribe; and their half-brothers, the Digaros, whose habitat reaches from our borders to about halfway between Sadiya and Rima, have traded at our marts for generations, and have always been known as a peaceable and well-behaved community. The Mijus are quite as peaceful and well behaved, and the only reason why we see less of this portion of the tribe is that the Digaros, acting as middle men with regard to all goods obtainable from our marts, prevent them coming in in order to retain the trade in their own hands.

F. J. Needham.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1903–1904.

Sixth Ordinary Meeting, January 25, 1904.—Sir Clements Markham, K.C.B., F.R.S., President, in the Chair.

Elections.—*Reginald Bate; Lord Osborne de Vere Beauclerk; Rev. C. T. Collyer; Edward Denne, A.C.P.; Lieut. Montagu C. Dobson, R.F.A.; Albert Bevan Evans; Captain George Bennett Gosling, Rifle Brigade; Captain Frank Ernest Gunter, R.A.M.C.; Angus Hamilton; Robert William Hutchinson, B.Sc.; Richard Blair Hutton; Lieut.-Colonel Louis Jackson, R.E.; John J. Lawton; George McDonald; Lieut. John Arthur McQueen, R.E.; Edmund Maurice; Lieut. Gilbert Russell (Grenadier Guards); Henry Farrington Searle; James Sorley, F.R.S.E., F.S.S.; Ernest Edwin Speight; Charles Thursby; Herbert Perkins Vacher, A.M.I.C.E.; G. W. F. Wright.*

Honorary Corresponding Member.

Colonel J. de Shokalsky, Secretary, Physical Section of the Russian Geographical Society.

The Paper read was:—

"The Geographical Pivot of History." By H. J. Mackinder, M.A.

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* Mr. Needham leaves the date blank, but we presume this is the journey to which he refers. Mr. Needham's letter is based on an obvious misunderstanding. Mr. Freshfield was writing of the Tsanpo Brahmaputra. The Zayul Chu (sometimes called the Lohit Brahmaputra), which Mr. Needham explored on his journey in 1885 from Sadiya to Rima, is an eastern affluent of the great Tibetan river.—Ed. *G.J.*

Seventh Ordinary Meeting, February 8, 1904.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Neville A. D. Armstrong; Lieut. Goland V. Clarke* (*18th Hussars*), *D.S.O.; Martin Francis Ellis; George Alexander Grant; Joseph P. Harper; Charles William Laver; Major R. P. Lee, R.E.; Major George Feilden Menzies* (*South Lancashire Regt.*); *Captain C. M. Molloy* (*Poona Horse*); *Colonel W. Pitt, R.E.; E. Alexander Powell; James Brownlee Sanford, M.D.; William Thomas Smedley; Captain George Smith* (*Royal Australian Artillery*); *Rev. John Charles Titcombe.*

The paper read was:—

"Turkestan and a Corner of Tibet." By Oscar T. Crosby.

THE NATIONAL ANTARCTIC EXPEDITION.

The PRESIDENT said: Before proceeding with the business of the evening, I wish to remind the meeting of the position of our Antarctic Expedition. At this very moment the men are all hard at work cutting a canal to bring our good ship out of the ice. You know how much we all owe to Captain Colbeck for what he has done for the *Discovery*. How last year he went out and forced his way through the ice, and, after encountering great difficulties, relieved our fellow-countrymen in the south and discovered their position—the most important point of all. Now, this year there were still great difficulties to encounter in fitting the ship out, and he has again started full of hope, full of resolution, he and his officers and men, all thinking how best they can serve the *Discovery*, all thinking of the great work those in the *Discovery* have done, and all anxious to help them. To show you what the feeling of the officers and men on board the *Morning* is, I cannot resist reading to you some lines which were written by one of those officers, and which have been sung weekly during the long voyage through the ice—

"Away in the deadly stillness,
Cut off from the world alone;
Held in the grasp of the Ice King
At the foot of his flaming throne.
Waiting the return of daylight,
Waiting the help we'll bring;
Wearily watching the hours go by,
Till the *Morning* comes with the spring.

"Far away in that cold white land,
By the throne of the great Ice King,
Braving his fury, daring his wrath,
With honour and glory showing the path.
God will keep them from harm and scaith,
Till the *Morning* comes with the spring.

"Bearing the flag of England
Far over the frozen sea,
Their motto and their watchword
'Discovery' still shall be.
Watching the stars in their courses,
Watching the needle swing;
Doing their duty, not counting the cost,
Till the *Morning* comes with the spring."

Well, with those feelings the *Morning's* officers and men have gone out, so you can imagine the way in which they are helping their brother explorers to cut a way out of the ice, each man working as hard as five navvies, and I venture to add, knowing the sort of men there are on board the *Morning* and on board the *Discovery*, and having myself had experience of cutting through 2 miles of ice, I feel a conviction that they will succeed, and that the ship will arrive safely in New Zealand next spring. Whether they succeed in bringing her out, or whether they are obliged to come home without her, they will be equally received by us as splendid explorers who have done magnificent work, and completed the labours which have ensured success to the expedition.

Eighth Ordinary Meeting, February 22, 1904.—Colonel G. Earl Church, Vice-President, in the chair.

Elections.—*Graham Buckley; David Davies, B.A.; J. Alan F. Field; John FitzTownsend; Alfred H. Harrison; Joseph Jennens; H. N. Kempthorne (Royal Scots Fusiliers); Harold H. A. de Laessoe; Frank Lumley, C.E.; Jeremiah Lynch; G. M. Oldham, R.E.; George Rymer Roberts.*

The Papers read were:—

1. "A Pioneer Journey in Angola." By Captain Boyd A. Cuninghame.
2. "A Journey in Northern Uganda." By Major P. H. G. Powell-Cotton.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *C. Rd.* **137** (1903): 1307–1308. **Haug.**

Sur les racines de quelques nappes de charriage des Alpes occidentales. Note de E. Haug.

Alps. *C. Rd.* **137** (1903): 939–941. **Termier.**

Sur la synthèse géologique des Alpes orientales. Note de P. Termier.

Alps. **Rey.**

Guido Rey. Il Monte Cervino. Illustrazioni di Edoardo Rubino. Prefazione di Edmondo de Amicis. Nota Geologica di Vittorio Novarese. Milano: Ulrico Hoepli, 1904. Size 12 × 8½, pp. xvi. and 288. *Illustrations. Price L.25. Presented by the Publisher.*

Mainly a history of the exploration of the group.

Alps—Cartography. *Z. Deutsch. u. Österreich. Alpenv.* **33** (1902): 32–38. **Oberhummer.**

Die Entwicklung der Alpenkarten im 19. Jahrhundert. Von Eugen Oberhummer. *With Maps.*

Alps—Historical. *Z. Deutsch. u. Osterreich. Alpenv.* **33** (1902): 71–95. **Ramsauer.**

Die Alpen im Mittelalter. Von Franz Ramsauer.

Austria.—Bosnia. **Katzer.**

Geologischer Führer durch Bosnien und die Hercegovina. Herausgegeben anlässlich des IX. internationalen Geologencongresses von der Landesregierung in Sarajevo. Verfasser: Landesgeolog Dr. F. Katzer. Sarajevo, 1903. Size 9 × 6, pp. 280. *Maps and Illustrations. Price 6s.*

Austria—Karst. *Globus* **84** (1903): 281–286. **Rzehak.**

Das Karstphänomen im mährischen Devonkalk. Von Prof. A. Rzehak. *With Illustrations.*

Central Europe—Caves. *Globus* **84** (1903): 349–352. ——

Die künstlichen Höhlen Mitteleuropas, ein ungelöstes Rätsel. *With Illustrations.*

Faroe Islands—Botany. **Ostenfeld and others.**

Botany of the Færöes based upon Danish Investigations. Parts i. and ii. Copenhagen: Det Nordiske Forlag, 1901–1903. Size 10 × 7, pp. 682. *Maps and Illustrations. Presented by the Authors.*

There is a valuable section by C. H. Ostenfeld on the geography and topography of the group, with notes on the geographical relations of the flora.

France. *Deutsch. G. Blätter* **26** (1903): 105–119. **Verbeek.**

Der Puy de Dôme und das Hochland der Auvergne. Von Dr. P. Verbeek.

France—Corsica. *Geolog. M.* **11** (1904): 12–13. **Tuckett.**

Remarkable Examples of Atmospheric Erosion of Rocks in Corsica. By F. F. Tuckett.

France—Dune-planting. *B.S.G. Com. Bordeaux* **29** (1903): 307–311. **Buffault.**

Essais d'introduction dans les dunes de Gascogne de végétaux étrangers aux sables. Par P. Buffault.

France—Garonne. *C. Rd.* **137** (1903): 1305–1306. **Fabre.**

Sur le glaciaire de la Garonne. Note de L. A. Fabre.

France—Languedoc. *B.S. Languedoc. J.* **23** (1903): 121–152, 268–304. **Hardy.**

La Géographie et la Végétation du Languedoc, entre l'Hérault et le Vidourle Étude Écologique. Par Marcel Hardy. *With Maps and Plates.*

Germany—Early Maps. *Deutsch. G. Blätter* **26** (1903): 120–138. **Wolkenhauer.**

Ueber die ältesten Reisekarten von Deutschland aus dem Ende des 15. und dem Anfange des 16. Jahrhunderts. Von Dr. A. Wolkenhauer.

Norway. *G.Z.* **9** (1903): 425–435. **Reusch.**

Betrachtungen über das Relief von Norwegen. Von Dr. Hans Reusch. *With Illustrations.*

Norway. **Slingsby.**

Norway, the Northern Playground. Sketches of Climbing and Mountain Exploration in Norway between 1872 and 1903. By W. Cecil Slingsby. Edinburgh: David Douglas, 1904. Size 9½ × 6, pp. xviii. and 426. *Maps and Illustrations. Price 16s. net. Presented by the Publisher.*

One of the best books on mountaineering in Norway that has yet appeared. It is well illustrated by sketches, photographs, and maps, some of the last embodying original work to some extent. There is much to interest the general tourist as well as the mountaineering expert.

Russia—Ural. *Le Globe, Mém. S.G. Genève* **42** (1903): 1–44. **Duparc.**

Nouvelles explorations dans l'Oural du nord: le bassin supérieur de la Kosva. Par M. le prof. L. Duparc. *With Maps and Illustrations.*

Spain. **Calvert.**

Impressions of Spain. By Albert F. Calvert. London: G. Philip & Son, 1903. Size 9 × 6½, pp. xx. and 348. *Map and Illustrations. Price* 10*s.* 6*d. Presented by the Publishers.*

Notes on people and places visited by the author during journeys in Spain, profusely illustrated from photographs.

Switzerland. **Hasler.**

The Bernese Oberland. By G. Hasler. Vol. i. From the Gemmi to the Mönchjoch. (Conway and Coolidge's Climber's Guides.) London: T. Fisher Unwin, 1902. Size 5½ × 3½, pp. xxvi. and 164. *Price* 10*s. Presented by the Publisher.*

Switzerland—Alpine Flora. **Jerosch.**

Geschichte und Herkunft der Schweizerischen Alpenflora. Eine Uebersicht über den gegenwärtigen Stand der Frage, von Marie Ch. Jerosch. Leipzig: W. Engelmann, 1903. Size 9½ × 6½, pp. vi. and 254. *Price* 8*s.*

Turkey—Eastern Rumelia. **Giacchi.**

La Rumelia Orientale sotto l'aspetto storico, giuridico e commerciale. Relazione del Nobile Cavaliere Giueseppe dei Conti Giacchi. (B. Ministero Affari Esteri. Agosto, 1903.) Roma, 1903. Size 9½ × 6½, pp. 82.

United Kingdom—England and Wales. **Sanders and Ackland.**

A Digest of the Results of the Census of England and Wales in 1901, arranged in tabular form, together with an Explanatory Introduction. Compiled by W. Sanders, and produced under the general supervision of T. G. Ackland. London: C. & E. Layton, 1903. Size 9 × 6, pp. xxxii. and 132. *Presented by the Publishers.*

Owing to its concise form, this is a valuable aid to an appreciation of the main results of the last census.

United Kingdom—London—Historical. **Gordon.**

Old-time Aldwych, Kingsway, and Neighbourhood. By Charles Gordon. London: T. Fisher Unwin, 1903. Size 9½ × 6½, pp. xiv. and 368. *Maps and Illustrations. Price* 21*s. net. Presented by the Publisher.*

An interesting account of the neighbourhood of the Strand improvements in former times, with many illustrations and notes on the historical associations of the locality. The opening chapters give an outline of the history of the scheme now in course of execution. (See Reviews, *ante.*)

United Kingdom—Scotland. *Nature* **69** (1903): 174. **Watson.**

Internal Oscillation in the Waters of Loch Ness. By E. R. Watson. *With Diagrams.*

ASIA.

Arabia. *M.K.K.G. Ges. Wien* **46** (1903): 219–264. **Hein.**

Ein Beitrag zur Statistik Südarabiens (Tabellen zur Statistik von Gischin im Mahralande). Von Dr. W. Hein.

Central Asia. **Salzmann.**

Im Sattel durch Zentralasien, 6000 Kilometer in 176 Tagen. Von Erich von Salzmann. Berlin: Dietrich Reimer (Ernst Vohsen), 1903. Size 10½ × 7½, pp. 312. *Maps and Illustrations. Price* 5*m.*

The author crossed Asia from Northern China to the Caspian by way of the Gobi, Chinese and Russian Turkestan.

Central Asia. **Olufsen.**

The Second Danish Pamir-Expedition. Old and New Architecture in Khiva, Bokhara, and Turkestan. By O. Olufsen. Copenhagen: Gyldendalske Boghandel, 1904. Size 14½ × 11½. 38 Columns. *Plates. Presented by the Author.*

The text is chiefly descriptive of the fine plates, made from the author's photographs and drawing.

Central Asia—Horse. *Naturw. Wochenschrift* **2** (1903): 581–583. **Matschie.**

Giebt es in Mittelasien mehrere Arten von echten Wildpferden? Von Prof. P. Matschie. *With Illustration.*

Ceylon—Survey. **Grinlinton.**

Ceylon Administration Reports, 1902. Part ii. Scientific Survey Department. Report of Mr. F. H. Grinlinton, Surveyor-General. [1903.] Size 13½ × 8½, pp. 36. *Map. Presented by the Surveyor-General.*

China—Canal. *Beiträge Kolonialpolitik* **5** (1903–1904): 115–134. **Stenz.**

Der Kaiserkanal. Seine Geschichte, sein jetziger Zustand, seine Bedeutung und sein Lauf innerhalb Schantung. Von P. G. M. Stenz. *With Maps.*

China—Canal. *Asien* **3** (1903): 9–11. **Elg.**

Der Kaiser-Kanal vôm Yangtsekiang bis zum Peiho, seine Lage, Beschaffenheit und kommerzielle Bedeutung. Von Elg. *With Map.*

China—Miao Tribe. *J.G., Tôkyô G.S.* **15** (1903): 385–400, 465–574. **Torii.**

Geographical Distribution and Present Condition of the Miao Tribe in China. By Ryôzô Torii. [In Japanese.] *With Illustrations.*

China—Railway. *Minutes of P.I. Civil Engineers* **152** (1903): 157–184. **Bourne.**

The Construction of the Lu-Pao District of the Lu-Han Railway. By T. J. Bourne. *With Map and Diagrams.*

On the section of the Peking-Hankow railway between Lu-kou Chiao and Pao-ting Fu.

China—Trade. ———

China. Imperial Maritime Customs. I.—Statistical Series: Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1902. Part II.—Reports and Statistics for each Port, with Report on Foreign Trade of China. Shanghai: Kelly & Walsh, 1903. Size 11 × 9, pp. xvi. and 874. *Plan and Diagrams.*

Chinese Empire—Mongolia. *J.G., Tôkyô G.S.* **15** (1903): 28–41. **Ogawa.**

A Topographical and Geological Sketch of the Eastern Inner Mongolia. By Takudzi Ogawa. [In Japanese.] *With Illustrations.*

Chinese Empire—Tibet. **Futterer.**

Petermanns M., Ergänzungsheft Nr. **143** (1903): pp. 66.

Geographische Skizze von Nordost-Tibet. Von Dr. K. Futterer. *With Maps.*

French Indo-China. **Pavie.**

Mission Pavie Indo-Chine. Atlas. Notices et Cartes. Par Auguste Pavie. Paris: A. Challamel, 1903. Size 11½ × 9, pp. 54.

India. **Gibbs.**

India: our Eastern Empire. By P. H. Gibbs. London: Cassell & Co., 1903. Size 7 × 5, pp. viii. and 208. *Illustrations. Price 2s. 6d. Presented by the Publishers.*

A useful popular account of the main facts connected with the history of India as a British Dependency, forming one of a series dealing with each of the great colonies and possessions in turn.

India. **Métin.**

Albert Métin. L'Inde d'aujourd'hui. Étude sociale. Paris: A. Colin, 1903. Size 7½ × 5, pp. 304. *Price 3 fr. 50 c. Presented by the Publisher.*

Treats of such subjects as the religious feelings of the Hindus, the history of Islam in India, British administration and relations with the natives, and the industrial life of the country.

India—Burma—Kokang. ———

Imp. and Asiatic Quarterly Rev. **16** (1903): 337–349.

An interesting but little-known Chinese corner of British India. By Pinya.

India—Geological Survey. **Holland.**

General Report on the work carried on by the Geological Survey of India for the year 1902–1903. By T. H. Holland. Calcutta, 1903. Size 10½ × 7, pp. 26. *Presented by the Geological Survey of India.*

India—Historical. **Hill**

Three Frenchmen in Bengal; or, the Commercial Ruin of the French Settlements in 1757. By S. C. Hill. London: Longmans & Co., 1905. Size 9 × 6, pp. x. and 182. *Maps and Plans. Price 7s. 6d. net.*

Deals with French proceedings in Bengal just before the final contest for supremacy

with the English, mainly from unpublished documents. The three central figures are M. Renault, Chief of Chandernagore; M. Law, of Cossimbazar; and M. Courtin, of Dacca.

India—Karachi. *Mem. Geolog. Surv. India* **34** (1903): 133–157. **Oldham.**
A Note on the Sandhills of Clifton near Karachi. By R. D. Oldham. *With Maps and Plates.*

India—Malaria. **James.**
Malaria in India. By Captain S. P. James. (Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. New Series. No. 2.) Calcutta, 1902. Size 12 × 9½, pp. 106. *Illustrations. Price* 2*s.* 3*d. Presented by the Indian Government.*

India—Portuguese Territory. *B.S.G. Lisboa* **20** (1902): 3–207. **Pinheiro.**
Restauração social e economica do Estada da India. Por José do Nascimento Pinheiro.

India—Punjab. *J.R. Asiatic S.* (1903): 685–702. **Smith.**
The Position of the Autonomous Tribes of the Panjāb conquered by Alexander the Great. By V. A. Smith. *With Map.*

Indian Ocean—Maldive and Laccadive Islands. **Gardiner.**
The Fauna and Geography of the Maldive and Laccadive Archipelagoes. . . . Edited by J. Stanley Gardiner. Vol. ii. Part ii. Cambridge: the University Press; London: C. J. Clay & Sons. 1903. Size 11½ × 9, pp. 589–698. *Plates. Price* 15*s. net.*

Japan. *J.G., Tōkyō G.S.* **15** (1903): 421–424. **Fukuchi.**
The Fuji Line and the islands lying south of Izu Province. By Nobuyo Fukuchi. [In Japanese.]

Japan—Formosa. *J.G., Tōkyō G.S.* **15** (1903): 68–76, 167–175, 248–255. **Taguchi.**
Resources of Taiwan. By Kokichi Taguchi. [In Japanese.]

Japan—Marcus Island. *J.G., Tōkyō G.S.* **15** (1903): 42–51, 135–142. **Shiga.**
Minamitorishima (Marcus Island), and the Northern Pacific Ocean. By Shigetaka Shiga. [In Japanese.]

Japan—Shikoku. *J.G., Tōkyō G.S.* **15** (1903): 143–152. **Ogawa.**
Crystalline Schists forming the Median Zone of Shikoku. By Takudzi Ogawa. [In Japanese.]

Japan—Torishima. *J.G., Tōkyō G.S.* **15** (1903): 211–219, 296–303. **Kanehara.**
Eruption of Torishima Volcano. By Nobuyasu Kanehara. [In Japanese.] *With Illustrations.*

Korea. *Nineteenth Century* **54** (1903): 919–925. **Farrer.**
Impressions of Korea. By R. J. Farrer.

Korea. *Fortnightly Rev.* **74** (1903): 846–863. **Stead.**
The Question of Korea. By Alfred Stead.

Malay Archipelago—Sumatra. *Tour du Monde* **9** (1903): 565–588. **Bernard.**
A travers Sumatra.—De Batavia à Atjeh. Par F. Bernard. *With Map and Illustrations.*

Persia. **Schulz.**
Zustände im heutigen Persien wie sie das Reisebuch Ibrahim Begs enthüllt. Aus dem persischen uebersetzt und bearbeitet von Dr. Walter Schulz. Leipzig: K. W. Hiersemann, 1903. Size 9½ × 6½, pp. xx. and 332. *Map and Illustrations. Price* 23*s.*

Impressions regarding the present condition of Persia, by a Persian resident of Cairo, who has travelled extensively in his own country, and has at heart its opening to Western civilization.

Russia—Siberia. *B.A. Imp. Sci. St. Petersbourg* **16** (1902): 137–174. **Herz.**
Rapport du chef de l'expédition de l'Académie Impériale des Sciences à la rivière Bérésovka pour chercher un corps de mammouth. Par O. Herz. [In Russian.] *With Plates.*

Russia—Siberia—Geology. ———
Explorations géologiques et minières le long du Chemin de fer de Sibérie. Liv.

i.–xxi., xxiv., xxvi. [In Russian.] St. Petersburg, 1896–1903. Size 12½ × 9. *Maps. Presented by Colonel J. de Shokalsky.*

Russia—Siberia—Lena. *B.A. Imp. Sci. St. Pétersbourg* **14** (1901): 525–528. **Vannari.**

Sur la température de l'eau dans la rivière Léna. Par P. Vannari. [In Russian.]

Turkey—Asia Minor. **Fitzner.**

Forschungen auf der Bithynischen Halbinsel. Von Dr. R. Fitzner. Rostock: C. J. E. Volckmann, 1903. Size 8½ × 6, pp. 184. *Map and Illustrations. Price 6s.*

Turkey—Syria. **Médawar.**

La Syrie Agricole. Thèse soutenue en 1903 à l'Institut Agricole International de Beauvais devant MM. les Délégués de la Société des Agriculteurs de France. Par Wady Médawar, 1903. Size 10 × 6½, pp. 476.

Suggestions for the agricultural development of Syria.

AFRICA.

Africa—Trade. *Board of Trade J.* **43** (1903): 395–399. **Africa.**

Trade of the United Kingdom with the African Continent in 1898–1902.

Algeria. *B.R.S.G. Madrid* **45** (1903): 158–179. **Espinosa.**

Sidi-Bel-Abbés. Conferencia pronunciada en la R.S.G., 29 April 1902. Por Don Sixto Espinosa.

Cape Colony. ———

Statistical Register of the Colony of the Cape of Good Hope for the year 1902, with supplement for March quarter, 1903. Cape Town, 1903. Size 13 × 8½, pp. xvi. and 352. *Two Copies, presented by the Agent-General for the Cape of Good Hope.*

Cape Colony—Historical. **Trotter.**

Old Cape Colony. A Chronicle of Her Men and Houses from 1625 to 1806. By Mrs. A. P. Trotter. London: A. Constable & Co., 1903. Size 9½ × 6, pp. 320. *Illustrations. Price 10s. 6d. net. Presented by the Publishers.*

Contains much interesting information on the old days of Cape Colony not to be found in histories of a more systematic character. The author has done good service to the future student by rescuing from oblivion many of the antiquities of the Colony to be so soon swept away by modern improvements.

Central Africa—Bangweolo. *Mouvement G.* **20** (1903): 622–628. **Wauters.**

La terrasse du Bangweolo et l'écoulement de ses eaux par les chutes Giraud. Par A. J. Wauters. *With Map.*

Congo State—Botany. **Wildeman.**

Etat Indépendant du Congo. Annales du Musée du Congo. Botanique—Série V. Études de systématique et de géographie botaniques sur la Flore du Bas- et du Moyen-Congo. Par Ém. de Wildeman. Vol. i. Fasc. i. Bruxelles, 1903. Size 14½ × 11, pp. 88. *Plates.*

Congo State—Pigmies. *Ann. Rep. Smithsonian I.* (1902): 479–491. **Johnston.**

The Pygmies of the great Congo forest. By Sir H. H. Johnston, G.C.M.G. *With Illustrations.*

Reprinted, with additions, from *McClure's Magazine*, 1902.

East Africa. **Schoeller.**

Mitteilungen über meine Reise nach Aequatorial-Ost-Afrika und Uganda 1896–1897. Von Dr. Max Schoeller. Band ii. Berlin: Dietrich Reimer (Ernst Vohsen), 1904. Size 11½ × 7½, pp. 332 and 34. *Illustrations. Presented by the Author.*

The first and third volumes of this important work were noticed in the *Journal* for January, 1903 (p. 66). The present volume deals with the routes within British territory, and contains a number of plates illustrating objects of ethnographic interest.

Egypt. *J.R. Asiatic S.* (1903): 791–816. **Guest and Richmond.**

Miṣr in the Fifteenth Century. By A. R. Guest and E. T. Richmond. *With Plan.*

Nile—Exploration. **Johnston.**

The Story of Exploration. Edited by J. Scott Keltie, LL.D. The Nile Quest. By Sir Harry Johnston, G.C.M.G., K.C.B. London: Lawrence & Bullen, 1903. *Maps and Illustrations. Price 7s. 6d. Presented by the Publishers.*

The first of a new series on the history of exploration. The book is specially noticed elsewhere (*ante*, p. 375).

North Africa. **Duponchel.**

B.S. Languedoc. G. **25** (1902): 129–158, 267–297, 396–409; **26** (1903): 153–172.

La colonisation française dans le nord de l'Afrique et la culture de l'olivier dans l'ancienne Byzacène (Tunisie centrale). Par A. Duponchel.

Portuguese West Africa—São Thomé. *B.S.G. Lisboa* **20** (1902): 299–357. **Guedes.**

Viação em S. Thomé. Por A. Pinto de Miranda Guedes. *With Map.*

Rhodesia. *P. Rhodesia Sci. Assoc.* **4** (1903): 10–17. **White.**

Observations on Recent Discoveries at Ancient Ruins. By Franklin White.

Sierra Leone. **Crooks.**

A History of the Colony of Sierra Leone, Western Africa. With Maps and Appendices. By Major J. J. Crooks. Dublin, etc.: Browne & Nolan; London: Simpkin & Co. 1903. Size 7½ × 5, pp. xiv. and 376. *Price 5s. net. Presented by the Publishers.*

A detailed and carefully compiled history of the colony, by a former colonial secretary.

South Africa. **Bigelow.**

Poultney Bigelow. Au Pays des Boers. Le Cap, Lourenço-Marquès, le Natal, le Transvaal. Paris: F. Juven, [*not dated*]. Size 8 × 5½, pp. 316. *Map and Illustrations. Price* 3.50 *fr. Presented by the Author.*

Account of journeys made in 1896.

South Africa. **Ransome.**

The Engineer in South Africa. A Review of the Industrial Situation in South Africa after the War and a Forecast of the Possibilities of the Country. By Stafford Ransome. London: A. Constable & Co., 1903. Size 9 × 6, pp. xvi. and 320. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

South and East Africa. **Lucas and Egerton.**

Geography of South and East Africa. By C. P. Lucas, C.B. Being Part ii. of vol. IV. of A Historical Geography of the British Colonies, revised to 1903, and with chapters on the Transvaal and Orange River Colony added. By H. E. Egerton. Oxford: the Clarendon Press, 1904. Size 8 × 5, pp. 170. *Maps. Price 3s. 6d. Presented by the Publishers.*

Apart from the chapters on the new South African colonies, this has hardly been brought so completely up to date as could be wished. Thus, Northern Rhodesia has no special notice, but is only vaguely referred to under "British Central Africa."

Transvaal. *Science* **18** (1903): 696–699. **Davy.**

Notes on the Vegetation of the Transvaal. By J. B. Davy.

Uganda.

Africa. No. 15 (1903). General Report on the Uganda Protectorate for the year ending March 31, 1903. London: Eyre & Spottiswoode, 1903. Size 13 × 8½, pp. 36. *Price 4d.*

NORTH AMERICA.

Canada—Geological Survey.

Summary Report of the Geological Survey Department of Canada for the Calendar Year 1902. Ottawa, 1903. Size 10 × 6½, pp. vi. and 482. *Maps. Presented by the Geological Survey Department, Ottawa, Canada.*

From a geographical point of view, the most important explorations described in this report are those of Mr. McConnell, on the Macmillan river (Yukon Territory); of Messrs. McInnes and Parks, in the Lake Nipigon region; and of Mr. Wilson, on the west side of James bay.

Canada—Quebec. **Parker and Bryan.**

Old Quebec, the Fortress of New France. By G. Parker and C. G. Bryan. London: Macmillan & Co., 1903. Size 9 × 6, pp. xxiv. and 486. *Maps, Plans, and Illustrations. Price 15s. net.*

Traces the fortunes of Quebec from the time of the French pioneers through the days of the *régime* of the "great companies," the events of the nineteenth century being briefly sketched in the last two chapters.

Canada—Trade. *Handelsberichte, Serie IV. No.* **47** (1903): pp. 62. **Zimmerer.**
Handelsbericht des Kaiserlichen Konsulats in Montreal für 1902. Von V. Zimmerer, Kaiserlicher General-Konsul.
Reprint from the July No. of *Handelsarchiv.*

Mexico. *J. Geology* **11** (1903): 749–761. **Arreola.**
The Recent Eruptions of Colima. By José Maria Arreola.

North America. **Fountain.**
The Great North-West and the Great Lake Region of North America. By Paul Fountain. London: Longmans & Co., 1904. Size 9 × 6, pp. viii. and 356. *Price* 10*s.* 6*d. net. Presented by the Publishers.*

United States. **McClure.**
Analytical and Topical Index to the Reports of the Chief of Engineers and Officers of the Corps of Engineers, United States Army, 1866–1900. Compiled . . . by John McClure. 3 vols. Washington, 1902–1903. Size 9½ × 6, pp. 1788. *Presented by the Engineer Department, United States Army.*

United States—California. *J. Geology* **11** (1903): 431–458. **Hershey.**
The relation between certain river terraces and the glacial series in North-western California. By O. H. Hershey.

United States—California. *J. Geology* **11** (1903): 547–553. **Branner.**
A Topographic Feature of the Hanging Valleys of the Yosemite. By J. C. Branner. *With Illustrations.*

United States—Insanity. *National G. Mag.* **14** (1903): 361–378. **White.**
The Geographical Distribution of Insanity in the United States. By Dr. W. A. White. *With Maps.*

United States—Minerals. *National G. Mag.* **14** (1903): 331–339. **Kirchhoff.**
The United States: her Mineral Resources. By C. Kirchhoff.

United States—New York—Long Island. **Fuller and Veatch.**
Science **18** (1903): 729–731.
Results of the Re-survey of Long Island, New York. By M. L. Fuller and A. C. Veatch.

United States—Texas. *National G. Mag.* **14** (1903): 339–348. **Brewster.**
Expedition into Texas of Fernando del Bosque, Standard-Bearer of the King, Don Carlos II., in the year 1675. Translated from an old unpublished Spanish manuscript. By Betty B. Brewster.

United States—Timber trade. *National G. Mag.* **14** (1903): 381–386. **Price.**
The Influence of Forestry upon the Lumber Industry of the United States. By O. W. Price. *With Illustrations.*

CENTRAL AND SOUTH AMERICA.

Brazil. **Coudreau.**
O. Coudreau. Voyage au Rio Curua, 20. Novembre 1900—7. Mars 1901. Voyage à la Mapuerá, 21. Avril 1901—24. Décembre 1901. Voyage au Maycurú, 5. Juin 1902—12. Janvier 1903. 3 vols. Paris: A. Lahure, 1903. Size 11 × 9, pp. 144, 166, 152. *Map and Illustrations.*

Chili and Bosnia. *B.S.R.S. d'Anvers* **27** (1903): 108–123. **Jottrand.**
De l'Araucanie aux hauts plateaux boliviens. Par Victor Jottrand. *With Illustrations.*
One of the plates shows an *Araucaria* forest.

Dutch Guiana. *Bijd. Taal-, Land- en Volkenk. Ned.-Indië* **1** (1903): 451–650. **Coll.**
Gegevens over Land en Volk van Suriname. Door C. van Coll.

Dutch Guiana. *Tijds. K. Ned. Aardr. Genoots.* **20** (1903): 861–864. **Van Hasselt.**
Goninie-Expeditie. Door J. H. Van Hasselt.

Ecuador. *B. American G.S.* **35** (1903): 361–364. **Bennett.**
Guayaquil and Quito Railway. By F. W. Bennett. *With Map.*

Martinique. *Popular Sci. Monthly* **64** (1904): 219–231. **Jaggar.**
The Eruption of Pelée, July 9, 1902. By Prof. T. A. Jaggar, Jun. *With Illustrations.*

Martinique. *Science* **18** (1903): 792–795. **Russell.**

The Pelé Obelisk. By Prof. I. C. Russell.

Martinique. *National G. Mag.* **14** (1903): 422–423. ———

The New Cone of Mont Pelée. *With Illustrations.*

Panama—Canal. *Ann. Rep. Smithsonian I.* (1902): 537–557. **Burr.**

The Panama Route for a Ship Canal. By W. H. Burr. *With Illustrations.*

Reprinted from a published work.

Peru. **Clement.**

Estado Mayor General del Ejército, Viaje de Estado Mayor, 18 de Marzo—25 de Junio, 1902. Descripcion del Viaje, estudios tacticos, trabajos topográficos. Memoria del Coronel P. Clement. Chorrillos, 1902. Size 13½ × 9, pp. 452. *Maps and Illustrations.*

The expedition was planned for the study of the country traversed (in the Andean region of Cerro de Pasco and Huanuco) from a strategical point of view, and topographical work of some value was done by its members. A detachment made its way to the junction of the Mairo and Palcazu rivers, with a view to studying the question of the proposed road to the Ucayali.

St. Vincent and Martinique. ———

Further Correspondence relating to the Volcanic Eruptions in St. Vincent and Martinique, in 1902 and 1903. London: Eyre & Spottiswoode, 1903. Size 13½ × 8½, pp. xiv. and 194. *Price* 1*s.* 8*d.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia and Oceania. **Herbertson.**

Descriptive Geographies from Original Sources. Australia and Oceania. Selected by F. D. Herbertson. Edited by Dr. A. J. Herbertson. London: A. & C. Black, 1903. Size 7 × 5, pp. xxvi. and 222. *Illustrations. Price* 2*s.* 6*d. Presented by the Publishers.*

The series of Descriptive Geographies by the above authors, which will form an invaluable supplement to text-books for school use, is now completed as far as the main divisions of the world are concerned.

Marianne Islands—Guam. *Ann. Rep. Smithsonian I.* (1902): 493–508. **Safford.**

Guam and its People. By E. W. Safford. *With Illustrations.*

Reprinted from the *American Anthropologist*, 1902.

New Caledonia. **Myrica.**

A travers le Monde, Tour du Monde **9** (1903): 385–388, 393–396.

Le Nickel et la Nouvelle-Calédonie. Par Pierre de Myrica. *With Map and Illustrations.*

New Guinea—German. *Kolon. Z.* **4** (1903): 240–243, 284–286. **Boether.**

Die Bedeutung einer Durchquerung Neu-Guineas für die wirtschaftliche Entwickelung Kaiser-Wilhelmslands. Von. P. Boether.

New South Wales. **Carne.**

Mem. Geol. Surv. New South Wales, Geology No. 3 (1903): pp. 334.

The Kerosene Shale Deposits of New South Wales. By J. E. Carne. *With Maps, Plates, and Sections.*

New South Wales. **Hedley.**

Australian Museum, Sydney. Memoir iv. Scientific Results of the Trawling Expedition of H.M.C.S. *Thetis* off the Coast of New South Wales in February and March, 1898. Part 6. Mollusca. By Charles Hedley. Part ii. Scaphopoda and Gastropoda. Sydney, 1903. Pp. 327–602. *Plates.*

Samoa. **Krämer.**

Die Samoa-Inseln. Entwurf einer Monographie mit besonderer Berücksichtigung Deutsch-Samoas von Dr. A. Krämer. II. Band: Ethnographie. Nebst einem besonderen Anhang: Die wichtigsten Hautkrankheiten der Südsee. Stuttgart: E. Schweizerbartsche Verlagsbuchhandlung. E. Nägele, 1903. Size 12½ × 9½, pp. x and 446. *Illustrations.*

POLAR REGIONS.

Antarctic. *Le Correspondant* (1903): 47–66. **Lapparent.**

L'Attaque du Pôle Sud. Par A. de Lapparent. *With Map.*

Arctic. *La G., B.S.G. Paris* **8** (1903): 253–265. **Rabot.**

Quatre ans de lutte vers le Pole. Rapport du Commandant R. E. Peary. Par Charles Rabot. *With Map and Illustrations.*

Arctic. **Sverdrup.**

Otto Sverdrup, Nyt Land. Fire aar i Arktiske Egne. 2 vols, Kristiania, H. Aschehoug & Co. (W. Nygaard), 1903. Size 9½ × 6½, pp. (vol. i.) xii. and 506; (vol. ii.) x. and 524. *Portrait, Maps, and Illustrations. Presented by Sir C. R. Markham.*

Arctic. **Abruzzi.**

S. A. R. le Duc des Abruzzes. Expédition de l'Étoile Polaire dans la mer Arctique, 1899–1900. Traduit et résumé par M. Henry Prior. Paris: Hachette et Cie., 1904. Size 10 × 7, pp. 288. *Maps and Illustrations. Price* 17 *fr. Two copies. Presented by the Publishers.*

The Italian and English editions have already been noticed in the *Journal.*

Arctic—Historical. **Bénard.**

Charles Bénard. La Conquête du Pole. Histoire des Missions Arctiques depuis les temps les plus reculés jusqu'à nos jours. Paris: Hachette et Cie., 1904. Size 12½ × 8½, pp. xvi. and 384. *Maps and Illustrations. Price* 30 *fr. Two copies. Presented by the Publishers.*

A good general account of the leading events of Arctic exploration, though making no claim to be exhaustive or to throw new light on disputed questions.

Arctic—Russian Expedition. **Toll.**

B.A. Imp. Sci. St. Pétersbourg **15** (1901): 499–517; **16** (1902): 195–206.

Rapports sur les travaux de l'expédition Polaire Russe dirigée par le Baron Toll. II., III. [In Russian.] *With Maps and Plates.*

Novaya Zemlya. *Petermanns M.* **49** (1903): 217–219. **Philippow.**

Polarreisen des russischen malers Borissow. Von A. Philippow. *With Map.*

Spitsbergen. **Chernyschev.**

B.A. Imp. Sci. St.-Pétersbourg **14** (1901): 255–280, 351–377; **16** (1902): 133–159.

T. Tschernyschew: Sur la marche des travaux de l'expédition pour la mesure d'un arc du méridien au Spitzberg en 1899–1900. Ditto, en 1901. [In Russian.]

MATHEMATICAL GEOGRAPHY.

Astronomical Geography. **Schmidt.**

Astronomische Erdkunde. Von Dr. W. Schmidt. (Die Erdkunde . . . Herausgegeben von M. Klar. VI. Teil.) Leipzig und Wien: F. Deuticke, 1903. Size 10½ × 7, pp. viii. and 232. *Diagrams. Price* 7*m.*

Astronomical Instrument. *Petermanns M.* **49** (1903): 210. **Hammer.**

Das Claudesche "Prismen-Astrolabium." Von E. Hammer.

Cartography. **Vital.**

Die Kartenentwurfslehre. Bearbeitet von A. Vital. (Die Erdkunde . . . Herausgegeben von M. Klar. XXVI. Teil.) Leipzig und Wien: T. Deuticke, 1903. Size 10½ × 7, pp. viii. and 96. *Diagrams. Price* 4.20*m.*

Compass—Historical. *Riv. G. Italiana* **10** (1903): 314–334. **Porena.**

Un' ultima parola su Flavio Gioia e la bussola. Per il Prof. F. Porena.

Geodesy. **Haentzschel.**

Das Erdsphäroid und seine Abbildung. Von Dr. E. Haentzschel. Leipzig: B. G. Teubner, 1903. Size 9 × 6, pp. viii. and 140. *Price* 3.40*m. Presented by the Publisher.*

This work consists of two parts, the first giving a careful explanation of the mathematical principles involved in the determination of the figure of the Earth and of the solution of various subsidiary problems, such as those relating to the areas of successive zones of latitude, the length of the degree, and so forth; the second discussing various conical projections, with special reference to the German Government surveys.

Geodesy—Horizon. *Ann. Hydrographie* **12** (1903): 533–554. **Kohlschütter.**
Folgerungen aus den Kosschen Kimmtiefenbeobachtungen zu Verudella. Von Dr. E. Kohlschütter.

Measurement of Areas. *B.S.G. Italiana* **4** (1903): 863–865. **Magistris.**
Il principio della proporzionalità nelle misurazioni areometriche a proposito dell' area dell' isola d'Ischia. Osservazioni del L. F. de Magistris.

Surveying Instrument. *C. Rd. l'A. Sci.* **137** (1903): 781–783. **Schrader and Sauerwein.**
Sur l'emploi du tachéographe Schrader pour les travaux d'hydrographie. Note de MM. F. Schrader et Ch. Sauerwein.

Tables. *B. United States Geolog. Surv.* No. 214 (1903): pp. 284. **Gannett.**
Geographic Tables and Formulas. Compiled by S. S. Gannett.
An attempt to bring together from various sources "all tables and formulas used by the topographer in the field and office."

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Arid Regions. *American J. Sci.* **16** (1903): 377–378. **Keyes.**
Ephemeral Lakes in Arid Regions. By C. R. Keyes.

Geomorphology—Valleys. *La G., B.S.G. Paris* **8** (1903): 291–316. **Fabre.**
La Dissymétrie des Vallées et la loi dite de De Baer, particulièrement en Gascogne. Par L. A. Fabre. *With Map and Illustrations.*
This is noticed in the Monthly Record (*ante*, p. 393.)

Glaciers. *J. Geology* **11** (1903): 783–785. **Russell.**
Glacier Cornices. By Israel C. Russell.

Hydrology. **Van den Broeck and others.**
B.S. Belge Géologie **17** (1903): Mém. 239–308, 336–362, 391–414, 438–448.
La Vitesse de propagation des eaux souterraines et de la fluoroscéine dans les canaux et fissures des terrains Calcaires.

Hydrology. *Quarterly J.R. Meteorolog. S.* **29** (1903): 263–282. **Hooker.**
The Relation of the Rainfall to the Depth of Water in a Well. By Dr. C. P. Hooker. *With Diagrams.*

Meteorology—Hints.
Hints to Meteorological Observers in Tropical Africa, with instructions for taking observations and notes on methods of recording lake levels. (Meteorological Office, Official No. 162.) London: Eyre & Spottiswoode, 1902. Size 10 × 6½, pp. 16. *Diagrams. Price* 9*d. Presented by the Meteorological Office.*

Oceanography. *C. Rd.* **137** (1903): 748–749. **Thoulet.**
Sur la transparence de la mer. Note de M. Thoulet.

Physical Geography. **Berget.**
Physique du Globe et Météorologie. Par A. Berget. Paris: C. Naud, 1904. Size 9½ × 6½, pp. vi. and 354. *Maps and Diagrams. Price* 15 *fr.* [To be reviewed.]

Plant-Geography. **Schimper.**
Plant-Geography upon a Physiological Basis. By Dr. A. F. W. Schimper. The Authorized English Translation, by William R. Fisher. Revised and edited by Percy Groom and I. B. Balfour. Part i. October, 1903. Oxford: the Clarendon Press, 1903. Size 10 × 7, pp. 256. *Illustrations. Presented by the Publishers.*
This work promises to be an indispensable authority on the relations of plant-life to external factors.

Sun Spots and Magnetism. *C. Rd.* **137** (1903): 747–748. **Quénisset.**
Remarques sur le dernier groupe de taches solaires et les perturbations magnétiques. Note de F. Quénisset.

Zoogeography—Mosquitoes. *Science* **18** (1903): 761–764. **Smith.**
Concerning Mosquito Migrations. By Prof. J. B. Smith.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Demolins.**

Comment la route crée le type social. Par E. Demolins. Les routes du Monde moderne. Paris: Firmin-Didot et Cie., [not dated]. Size 7½ × 5, pp. viii. and 540. *Map. Price* 3.50 *fr.*

Anthropogeography. *G.Z.* **9** (1903): 489–513. **Ratzel.**

Die geographischen Bedingungen und Gesetze des Verkehrs und der Seestrategik. Von F. Ratzel.

Anthropology. **Schurtz.**

Völkerkunde. Von Dr. H. Schurtz. (Die Erdkunde . . . Herausgegeben von M. Klar. XVI. Teil.) Leipzig und Wien: F. Deuticke, 1903. Size 10½ × 7, pp. xiv. and 178. *Illustrations. Price* 7 *m.*

Commercial geography—Forests. *La G., B.S.G. Paris* **8** (1903): 125–134. **Flahault.**

Forêts et industrie des bois. France et Nouvelle-Zélande. Par C. Flahault.

Commercial geography—Postal Union. **Jung.**

Der Weltpostverein und sein Einfluss auf den Weltverkehr und die Weltwirtschaft. Ein Vortrag, gehalten in der Gesellschaft für Erdkunde und Kolonialwesen zu Strassburg von J. Jung. Strassburg: J. H. E. Heitz (Heitz und Mündel), 1903. Size 10 × 6½, pp. iv. and 46. *Diagrams. Price* 3*s.*

Economic geography. *Globus* **84** (1903): 69–72, 85–87. **Friedrich.**

Einige Kartographische Aufgaben in der Wirtschaftsgeographie. Von Dr. E. Friedrich.

Historical. **Oppert.**

Tharshish und Ophir. Von Gustav Oppert. Berlin: J. Springer, 1903. Size 10½ × 7, pp. viii. and 88.

See review, *ante*, p. 378.

Historical—Early Map. *B.S.G. Italiana* **4** (1903): 499–502. **Bellio.**

Un disegno geografico di Donato d'Angelo detto il Bramante (n. Termignano 1444, m. Roma 1514) nota del Prof. V. Bellio.

On one of the geographical wall-paintings of which examples exist in several Italian cities. Executed about 1490–93, it shows the greater part of the old world on an Ptolemaic basis, but with additions from portolani, etc.

Historical—Sea-book. **Rebello.**

Livro de Marinharia. Tratado da Agulha de Marear de João de Lisboa. Roteiros, sondas e outros conhecimentos relativos á navegação. Codice do seculo xvi., que pertenceu á livraria do falecido Marquez de Castello Melhor, em cujo catalogo de manuscriptos tinha o numero 254; adquirido no respectivo leitão pelo Excel^mo Sr. Duque de Palmella. Copiado e coordenado por J. I. de Brito Rebello. Lisboa, 1903. Size 10½ × 7½, pp. lxxxii. and 308. *Presented by the Duke of Palmella.*

Historical Anthropogeography. *G.Z.* **9** (1903): 361–371, 436–447. **Götz.**

Züge und Ergebnisse einer historischen Geographie. Von Prof. Dr. W. Götz.

Illustrates a method of inquiry, which takes account of the changing relations between man and his environment in the course of ages, by the examples of Germany and Italy.

History of geography. *Rev. G. Italiana* **10** (1903): 297–313. **Bertacchi.**

Della Storia della Geografia con speciale riferimento alla Geografia matematica. Dal Prof. C. Bertacchi.

BIOGRAPHY.

Columbus. **Vignaud.**

A critical study of the various dates assigned to the Birth of Christopher Columbus. The Real Date 1451. With a Bibliography of the Question. By Henry Vignaud. London: Henry Stevens, 1903. Size 8 × 5½, pp. xii. and 122. *Presented by the Author.* [To be reviewed.]

Li Hung-chang. **Little.**

Li Hung-chang, his Life and Times. By Mrs. Archibald Little. London:

Cassell & Co., [1903]. Size 8½ × 5½, pp. viii. and 356. *Map and Portraits. Price* 15*s. net. Presented by the Publishers.*

Contains a large amount of information, obtained by painstaking research, on the whole history of China and its relations with European powers, as well as on the life of the central figure, whom the author regards as "one of the most brilliant figures of the nineteenth century."

Munk. **Knudsen.**

Den danske ishavsfarer Jens Munk. Ved J. Knudsen. Kjøbenhavn: G. E. C. Gad, 1902. Size 7½ × 4½, pp. 98. *Maps. Presented by the Publisher.*

An outline and appreciation of the services of Munk to the cause of Arctic exploration. The text of the 'Navigatio Septentrionalis' (of which an English version was issued by the Hakluyt Society in 1897) is not given.

Wakefield. **Wakefield.**

Thomas Wakefield, Missionary and Geographical Pioneer in East Equatorial Africa. By E. S. Wakefield. London: The Religious Tract Society, 1904. Size 8 × 5½, pp. 286. *Portrait and Illustrations. Price* 3*s.* 6*d. Presented by the Author.*

Mr. Wakefield's services in the cause of geography in East Africa are well known to our readers, and the present connected account—the first which has appeared—of his varied labours will be read with interest, although, in a work of the kind, it has, of course, been possible to utilize but a small part of the extensive material collected by the deceased missionary.

GENERAL.

Almanac. **Olsen.**

The Fisherman's Nautical Almanack and Tide Tables, 1904. A Directory of British and Foreign Fishing Vessels, Steamers, etc. By O. T. Olsen. London: J. D. Potter. Size 7½ × 5, pp. xxxix. and 522. *Price* 1*s. Presented by the Author.*

Almanac. ———

The American Ephemeris and Nautical Almanac for the year 1906. First Edition. Washington, 1902. Size 10½ × 7, pp. 596.

French Colonies. ———

Statistiques Coloniales pour l'Année 1900. Commerce (pp. xiv. and 994); ditto 1901 (pp. xx. and 1028). Melun, 1902–1903. Size 10 × 6½. *Presented by the French Government.*

Geography. *Z. Ges. Erdk. Berlin* (1903): 655–692. **Richthofen.**

Triebkräfte und Richtungen der Erdkunde im neunzehnten Jahrhundert. Von F. Freiherr von Richthofen.

Geography and History. *J.G.* **2** (1903): 404–415. **Allen.**

The Correlation of Geography and History. By Lyman R. Allen. *With Maps.*

Library Catalogue. ———

Società Geografica Italiana, Catalogo Metodico della Biblioteca Sociale (1868–1901). Parte Prima: Libri e Periodici. Roma, 1903. Size 10 × 6½, pp. xxiv. and 758. *Presented by the Società Geografica Italiana.*

This well-arranged catalogue will be a valuable bibliographical aid to geographers, including as it does many publications not generally known outside of Italy, as well as the best-known standard works of all countries. The bulk of the book is arranged according to subjects, but there is a complete index of authors.

Medical Geography—Sleeping Sickness. ———

Royal Society. Reports of the Sleeping Sickness Commission. No. 1. London: Harrison & Sons, 1903. Size 9 × 6, pp. 88. *Plates. Price* 7*s.* 6*d. Presented by the Royal Society.*

Paradox. **Robertson.**

The Mutual Relations of the Sun and Earth. By Dr. C. Robertson. Edinburgh: St. Giles Printing Company, 1903. Size 7½ × 5, pp. viii. and 60. *Presented by the Author.*

One of the constantly appearing publications, by unscientific writers, which seek to show that the existing ideas respecting the solar system, etc., are erroneous.

Portuguese Colonies. *B.S.G. Lisboa* **20** (1902): 209–297. **Pinto.**

O antigo imperialismo português e as leis modernas de governo colonial. Por C. Pinto.

Year-Book. **Trübner.**

Minerva. Jahrbuch der Gelehrten Welt. Herausgegeben von Dr. K. Trübner. Dreizehnter Jahrgang, 1903–1904. Strassburg: K. J. Trübner, 1904 [1903]. Size 6½ × 4½, pp. xl. and 1404. *Portrait. Price* 13*s.* 6*d.*

Year-book. **Wagner.**

Geographisches Jahrbuch. XXVI. Band, 1903. Herausgegeben von H. Wagner. Erste Hälfte. Gotha: Justus Perthes, 1903. Size 9 × 6, pp. 248.

This part deals with the regional geography of Europe, the literature of historical geography, and the recent progress of oceanography.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Bartholomew.**

The Survey Atlas of England and Wales. A series of eighty-four plates of maps and plans, with Descriptive Text, illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed by and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S. Parts xi. and xii. Edinburgh: John Bartholomew & Co. Under the Patronage of the Royal Geographical Society, 1903. *Price* 2*s.* 6*d. each part. Presented by the Publishers.*

Part xi. includes the following plates: No. 6 and 7, General Railway Map—northern and southern sections; sheets 44 and 45 of the 2-miles-to-an-inch general map of England and Wales, the former including the Ely and Wisbeach section, and the latter that of Norwich and Yarmouth.—Part xii. contains the following sheets of the 2-miles-to-an-inch general map: No. 46, Ipswich and Harwich; 47, Cambridge; 61, Canterbury; 74, Folkestone and Dungeness.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from January 1 to 31, 1904.

1 inch:—

(First revision) with hills in brown or black, 7, 8, 9, 11, 14, 21, 24, 29, 31. 1*s. each.*

Printed in colour, 38. 1*s.*

(Second revision) in outline, 254, 301. 1*s. each* (engraved).

With hills in brown or black, 4, 5. 1*s. each* (engraved).

6-inch—County Maps (first revision):—

Cambridgeshire, 58 N.E., 59 N.E., 60 S.E., 62*a* S.E., 62*b* N.W. **Dorsetshire,** 5 N.W., 5*a* S.E., 37 S.E. **Gloucestershire,** 24 S.W. **Leicestershire,** 28 S.W., 29 S.W., 30 S.W., S.E. **Radnorshire,** 5 S.E. **Shropshire,** 68 S.E., 71 S.W. **Somersetshire,** 27 N.E., 28 S.W., 74 N.E., S.E., 83 N.W. **Warwickshire,** 3 S.W. 1*s. each.*

25-inch—County Maps:—

Brecknockshire, V. 6, 9, 10, 11, 15; VIII. 3, 7, 11; XII. 10; XVII. 8; XVIII. 9. **Gloucestershire,** LV. 7; LXXI. 6; LXXII. 14. **Herefordshire,** VII. 13; X. 16; XI. 16; XII. 13, 14, 16; XIII. 13, 14, 15, 16; XIV. 13, 14, 15; XVII. 3, 5, 8; XVIII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16; XIX. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14; XX. 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16; XXI. 1, 3, 7, 9, 11, 14, 15; XXIV. 9, 10, 14, 15; XXV. 2, 3, 4, 8, 10, 11; XXVI. 3, 4; XXVII. 1, 2, 5, 6, 8, 9, 11, 12; XXVIII. 1, 2, 3, 6, 7, 9, 10, 11; XXX. 8; XXXI. 3, 9. **Leicestershire,** XXIV. 12; XXV. 4; XXVI. 8, 14, 16; *XXXII. 2, 3, 5, 7, 9, 10, 11, 12, 13, 14, 15, 16; *XXXI. 8, 9, 12, 16; XXXVI. 16; XXXVII. 1, 4, 5, 7, 12, 14, 15, 16; XXXVIII. 1, 2, 3, 4. 5, 6, 7, 8, 9, 11, 12, 13, 15; XLIII. 4, 8, 12; XLIV. 3, 6; XLV. 3, 13, 16; XLVIII. 4. **Radnorshire,** XVI. 15; XVII. 13; XXII. 4, 6,

7, 10, 11, 12, 15, 16; XXIII. 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16; XXVII. 3, 4, 7, 8, 11, 12; XXVIII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15; XXIX. 10, 15; XXX. 5; XXXII. 2, 4, 7, 10; XXXIII. 2, 6, 7; XXXIV. 9; XXXVI. 8. **Shropshire,** LXXIX. 16. **Somersetshire,** II. 8; VII. 9; VIII. 15; XIV. 7, 9, 10, 11, 14; XIX. 7; XX. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16; XXI. 1, 2, 5, 6, 14; XXVIII. 3, 7, 11; XXIX. 1, 2, 3, 4, 7, 8, 11, 12, 15, 16; XXX. 4, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXXV. 6, 11, 12, 13, 14, 15, 16; XXXVI. 11, 14, 16; XXXVII. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16; XXXVIII. 2, 3, 4, 5, 6, 7, 8; XXXIX. 4, 6, 7; XLI. 16; XLII. 1, 2, 3, 4, 5, 7, 8, 10, 12, 14; XLIII. 4, 8, 10, 11, 12; XLIV. 4, 7, 8 (16 and LVIa. 4); XLVII. 1, 2, 3, 5, 6, 7, 8; XLVIII. 2, 3, 4, 5, 7, 8; XLIX. 2, 4, 7, 8, 9, 10, 13, 14; LII. 1, 2, 3, 4, 8, 13, 15, 16; LIII. 4, 7, 8, 9, 10, 14; LIV. 1, 2, 3, 4, 11, 16; LVI. 1, 2, 3, 4, 5, 6, 11, 12, 16; *LVII. 9, 10, 13; *(LVIa. 4 and XLIV. 16); LXIII. 1, 2, 3, 9, 10, 11, 13; LXIV. 2, 3, 7, 11, 12, 15; LXV. 4, 6, 7, 8, 9, 10, 11, 12, 13; LXVII. 1, 2, 5, 6 (9 and 13), 10, 11, 12 (13 and 9), 14, 15; LXXII. 1, 3, 5, 7, 12; LXXIII. 11, 12, 13. **Staffordshire,** LXVIII. 3. **Suffolk,** LXI. 9; LXXIII. 8, 14; LXXIV. 5, 6, 7, 9, 10, 13, 15; LXXVI. 4, 10, 16; LXXIX. 2, 4, 6; LXXX. 3; LXXXIV. 4, 6, 11; LXXXVII. 1; LXXXVIII. 1, 2, 5, 6, 7; LXXXIX. 1, 2, 5. **Warwickshire,** VIII. 7; XVI. 8; XVII. 3, 5. **Worcestershire,** XXVII. 16; XXVIII. 14; XXXII. 4 (first revision of 1891 survey). **Yorkshire,** CCLXXXVII. 3. *3s. each.*

(*E. Stanford, London Agent.*)

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: 345, Sommerfeld; 370, Sorau; 371, Sprottau. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1903. *Price* 1.50 *mark each sheet.*

Germany. **Ludwig.**

Heimatskarte der Deutschen Literatur. Für Schulzwecke entworfen und gezeichnet von Prof. Karl Ludwig. Scale 1 : 800,000 or 12·6 stat. miles to an inch. 6 sheets. Vienna: G. Freytag and Berndt, 1903.

Prof. Karl Ludwig's wall-map of German literature consists of a faintly printed outline map of Germany, upon which are shown, in clear type, the names of towns and other places of special literary importance. By the side of the name of the town are given, in red, the names of German writers of note whose birth or residence in the place has rendered it of historical importance, together with the date of birth and death in each case. An index to all the names of persons mentioned on the map is given at the side, with reference numbers from which they may be found on the map itself. The scheme of the map is certainly good, and it has been well carried out.

Greece. **Curtius and Kaupert.**

Karten von Attika. Scale 1 : 100,000 or 1·6 stat. miles to an inch. Auf Veranlassung des Kaiserlich Deutschen Archäologischen Instituts und mit Unterstützung des Koniglich Preussischen Ministeriums der geistlichen, Unterrichts- und Medicinal-Angelegenheiten. Aufgenommen durch Offiziere und Beamte des K. Preussischen Grossen Generalstabes mit erläuterndem Text herausgegeben von E. Curtius und J. A. Kaupert. Heft x. Uebersichtskarte von Attika hergestellt auf Grundlage der Karte von Attika 1 : 100,000 mit den antiken Namen der Örtlichkeiten nach Arthur Milchhöfer. Berlin: Dietrich Reimer (E. Vohsen), 1903.

This is the concluding part of this important publication. It consists of a map of Attika on the scale of 1 : 100,000 reduced from the large 1 : 25,000 sheets, intended for general reference. The ancient place-names, which are according to Arthur Milchhöfer, are printed in red.

London. **Stanford.**

A New Map of Metropolitan Railways, Tramways, and Miscellaneous Improvements deposited at the Private Bill Office, November 30, 1903, for Session 1904. Scale 1 : 31,680 or 2 inches to a stat. mile. London: Edward Stanford, 1904. *Price* 6*s. Presented by the Publisher.*

ASIA.

China. **Jack.**

Map of part of the Province of Szechuan to illustrate the journeys of R. Logan Jack, LL.D., F.G.S. Scale 1 : 1,500,000 or 23·6 stat. miles to an inch. London: Edward Arnold, [1904].

The area here shown is that extending from Sung Pan Ting on the north to Chung

King and Yueh-Sui on the south. Dr. Logan Jack's journey was described in the *Geographical Journal* for March, 1902, and this map has been prepared to accompany his book giving a more complete account of his explorations. The map is an outline, with routes in red.

China. **Surveyor-General of India.**

Part of Chih-Li Province, China. Scale 1 : 506,880 or 8 stat. miles to an inch. Compiled under the direction of Colonel St. G. C. Gore, C.S.I., R.E., Surveyor-General of India. Season 1900–01. Calcutta: Survey of India Offices, 1903. *Presented by the Secretary of State for India, through the India Office.*

China. **Vogelsang.**

Wege-Aufnahmen im Gebirgslande des Ta-Pa-Shan (Chinesische Provinzen: Hupeh, Shensi und Szechuan), 9. Mai bis 11. Juni 1900. Ausgeführt und gezeichnet von Dr. Karl Vogelsang. Scale 1 : 400,000 or 6·3 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1904, Tafel 1. Gotha: Justus Perthes, 1904. *Presented by the Publishers.*

Eastern Asia. **Stanford.**

A new map of the Far East. By William Stanford. Scale 1 : 5,050,000 or 80 stat. miles to an inch. Oxford: Darbishire & Stanford, 1904. *Price* 1*s. net. Presented by William Stanford, Esq.*

A useful map for general reference in connection with the present war in the Far East. It shows railways, principal roads, boundaries, and contains two insets, one of Persia and the north-west frontier of India, and the other of routes to the East.

Eastern Asia. **Stanford.**

Map of Eastern China, Japan, and Korea. Scale 1 : 6,969,600 or 110 stat. miles to an inch. London: Edward Stanford, 1904. *Price* 3*s. Presented by the Publisher.*

Shows clearly railways open and in progress, steamer tracks with distances between the ports, submarine cables, and treaty ports. There is also an inset of Korea on an enlarged scale.

Tibet. **Stanford.**

A Map of part of Tibet, including Sikkim, the Chumbi Valley, and Bhutan, showing the routes between Darjeling and Lhasa. Scale 1 : 506,880 or 8 stat. miles to an inch. London: Edward Stanford, 1904. *Price* 5*s. Presented by the Publisher.*

An outline map, without hill shading, showing roads and means of communication between India and Tibet, *viâ* Sikkim, the Chumbi valley, and Bhutan. It has been compiled from recent Indian Government Survey maps and other material, including the map of Sikkim from surveys made by Prof. E. Garwood during Mr. D. W. Freshfield's expedition, which was published in the *Geographical Journal* for July, 1902. The map by Mr. Claud White, recently prepared at the Survey Department of India, does not appear to have been made use of, and the altitudes of peaks and passes agree with those given by Prof. Garwood's map. This map will be found specially useful in connection with present military operations in Tibet.

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheet: (Provisional) 55-N. Egyptian Sudan: Jebelein. London: Intelligence Division, War Office; Stanford, 1901. *Price* 1*s.* 6*d. Presented by the Director-General of Mobilization and Military Intelligence.*

Egypt. **Egyptian Survey Department.**

Topographical Map of Gharbia Province. Scale 1 : 10,000 or 0·15 stat. mile to an inch. Sheets N.E.: 31–1, 32–1, 32–2, 32–3, 32–4, 33–5, 34–5, 35–5, 35–6, 35–7, 36–7, 37–5, 37–6, 38–5, 38–6, 38–7, 39–7 and 8, 39 and 40–6, 40–5. Cairo: Survey Department. *Presented by the Director-General of the Survey Department, Cairo.*

German South-West Africa. **Sprigade and Moisel.**

Kriegskarte von Deutsch-Südwestafrika. Scale 1 : 800,000 or 12·6 stat. miles to an inch. Im Auftrage des Grossen Generalstabes auf Grundlage aller bisher veröffentlichten-Karten und der unveröffentlichten Materialien der Kolonial-Abteilung des Auswärtigen Amts u. a. m. hergestellt in der Kartograph Institut

Dietrich Reimer (Ernst Vohsen) unter Leitung von Paul Sprigade und Max Moisel. Blatt Windhuk nebst Uebersichtsblatt des gesamten Schutzgebiets. Berlin: Dietrich Reimer (Ernst Vohsen), 1904. *Price* 1*m*. *Presented by the Publisher.*

This map of German South-West Africa will, when complete, consist altogether of eight sheets. It has been compiled from all available information, both published and unpublished. Many of the positions must necessarily be extremely approximate, but the map will doubtless be more complete than any that have hitherto appeared. It has been prepared specially in connection with the present military operations in the region.

Tunis. **Babelon, Cagnat, and Reinach.**

Atlas Archéologique de la Tunisie. Edition Spéciale des cartes topographiques publiées par le Ministère de la Guerre accompagnée d'un texte explicatif par MM. E. Babelon, R. Cagnat, S. Reinach. 9e Livraison. Paris: E. Leroux, 1903.

Tunis. **Service Géographique de l'Armée, Paris**

Tunisie. Scale 1: 100,000 or 1·6 stat. miles to an inch. Sheets: 23, Sidi Youssef; 24, Le Kef; 30, Maktar; 34, Kalat Es Snam; 36, El Ala; 37, Kairouan; 38, Sidi El Hani; 40, Tebessa; 44, Oued Cherita; 48, Sbeitla; 50, Bou Tsadi. Paris: Service Géographique de l'Armée. *Price* 1.20*fr. each sheet.*

AMERICA.

Canada. **Petermanns Geographische Mitteilungen.**

Geologische Karte von West Canada. Nach den Aufnahmen des Geological Survey of Canada. Scale 1: 7,500,000 or 118·3 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1904, Tafel 2. Gotha: Justus Perthes, 1904. *Presented by the Publishers.*

Canada. **Surveyor-General's Office, Ottawa.**

Sectional map of Canada. Scale 1: 190,080 or 3 stat. miles to an inch. Cypress sheet (57), West of Third Meridian, revised to August 4, 1903; Peace Hills sheet (78), West of Fourth Meridian, revised to June 20, 1903. Ottawa: Surveyor-General's Office, 1903. *Presented by the Surveyor-General of Canada.*

United States. **Oliphant.**

Known Oil and Gas Fields of the United States. Compiled by F. H. Oliphant. Scale 1: 6,969,600 or 110 stat. miles to an inch. Edition of November, 1903. United States Geological Survey. *Presented by the United States Geological Survey.*

This is an outline map of the United States, showing in colours areas in which more or less petroleum is known to exist, areas in which natural gas is known to exist, and areas of possible extensions of petroleum or natural gas, in which only the general trend of similar strata is indicated. A table is also given of the production and value of petroleum and natural gas in 1902.

GENERAL.

Ancient Geography. **Kiepert.**

Formæ Orbis Antiqui. 36 Karten in Format von 52: 64 cm. mit Kritischen Text und quellenangabe zu jeder Karte. No. xxi. Roma Urbs temporibus liberæ reipublicæ. Magna Græcia. Mit 4 Seiten Text. No. xxii. Roma Urbs inde ab imp. Augusti ætate. Mit 4 Seiten Text. Bearbeitet und herausgegeben von Richard Kiepert. Berlin: Dietrich Reimer (Ernst Vohsen), 1903. *Price* 3*m*.

World. **Sohr—Berghaus.**

Neue zeitgemässe Bearbeitung von Sohr-Berghaus Hand Atlas über alle Teile der Erde. Entworfen und unter mitwirkung von Otto Herkt herausgegeben von Prof. Dr. Alois Bludau. Früher herausgegeben von F. Handtke. Neunte Auflage. Lieferung 7. Glogau: Carl Flemming. *Price* 1*m*.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during November and December, 1903. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
1698 m	= 14·9	England, south coast;—Dover bay. 2*s.*
1951 m	= {1·85 / 7·0}	England, west coast:—Liverpool bay. Prince's dock. 3*s.*
2326 m	= 2·0	Scotland, west coast:—Loch Killisport to Cuan sound, including the sound of Jura. 2*s.* 6*d.*
3377 m	= 1·4	Norway, west coast. Lofoten islands:—Ure to Bretlesnes. 2*s.* 6*d.*
3372 m	= 1·0	Greece, south coast:—Gulf of Lakonikos. 2*s.* 6*d.*
3389 m	= 0·42	Black sea, sea of Azov:—Taganrog gulf. 2*s.* 6*d.*
444 m	= {2·95 / 4·8}	West Indies, Cuba:—Cienfuegos bay (port Xagua). Entrance to Cienfuegos bay. 2*s.* 6*d.*
3413 m	= 3·0	South America, north coast. Margarita island:—La Mar bay. 1*s.* 6*d.*
3382 m	= 0·9	Gulf of Mexico. Mississippi river:—The passes to New Orleans. 2*s.* 6*d.*
1782 m	= 0·5	Peru:—Pisco bay to St. Elena point. 2*s.* 6*d.*
3393 m	= 0·36	Alaska:—Pribilof islands. 1*s.* 6*d.*
796 m	= 0·52	Malacca strait. Approaches to Malacca:—Pyramid shoal to Pulo Besar. 1*s.* 6*d.*
3394 m	= 0·59	Celebes:—Tanjong Lutuno to Dondo point. 2*s.* 6*d.*
3407 m	= 2·4	Philippine islands. Mindanao, north coast:—Murcielagos bay. 1*s.* 6*d.*
3369 m	= 0·73	Philippine islands:—Luzon island to Masbate island, including Tikao island. 2*s.* 6*d.*
3401 m	= 3·64	Philippine islands. Kalamianes group. Kulion island:—Halsey harbour. 1*s.* 6*d.*
3392 m	= 3·6	Philippine islands. Luzon, west coast:—Port Bolinao. 1*s.* 6*d.*
3386 m	= 6·0	China, east coast; Mirs bay:—Long harbour and approaches. 2*s.* 6*d.*
3388 m	= 0·7	China, north coast:—Terminal head to Hai Yung Tau, including Elliot and Blonde groups. 2*s.* 6*d.*
2436 m	= 3·7	Japan. Liukiu islands:—Unten ko. 1*s.* 6*d.*
3395 m	= 5·8	Japan. Plans on the west coast of Nipon:—Futami anchorage. 1*s.* 6*d.*
3374 m	= 3·48	Japan. Nipon, south coast:—Benten saki to Miwazaki, including Urakami ko and Katsuura wan. 2*s.* 6*d.*
3325 m	= 1·5	Japan, inland sea:—Channel between Neko seto and Mitsugi. 2*s.* 6*d.*
3391 m	= {4·0 / 5·9}	Solomon islands. Anchorages in Ysabel island:—Korrigole harbour, Vulavu anchorage. 1*s.* 6*d.*
3398 m	= 3·4	Solomon islands. Anchorages in Ysabel island:—Maringe lagoon. 1*s.* 6*d.*
3199 m	= {5·96 / 5·95}	Solomon islands. Anchorages in Ysabel island:—Kesuo cove, Tunnibuli. 1*s.* 6*d.*
2293		Mexico, south-west coast. Ports in gulf of California. New Plan:—Approach to La Paz harbour. Plan added:—La Paz harbour.
3138		Anchorages in south-east Alaska. Plan added:—Hassler harbour.
2772		Eastern archipelago. Anchorages in Gillola. Plan added.—Foja anchorage.
2718		Celebes. Anchorages on the east coast. Plans added:—Totok bay, Paguyama river entrance, Tomini road, Una una road, Togean anchorage, Luwuk bay, Arjuno bay, Lelompiug bay.
976		Philippine islands. Luzon island. New plan:—Port Mariveles.
2975		Japan. Anchorages on the west coast of Yezo island. New Plan:—Yesashi anchorage.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
—	Index Charts, A to P	New index Charts. A to V.	
1698	Dover bay.	New plan Dover bay	1698
1951	Liverpool bay, etc.	New plan. Liverpool bay, etc.	1951
2478 etc.	Locks Swen, Killisport,	New plan.	
2326	Lock Crinan to Cuan sound.	Lock Killisport to Cuan sound, including the sound of Jura	2326

No.		Cancelled by		No.
1685	Trinisi. Plan on this chart	New plan. Gulf of Lakonikos		3372
444	Port Xagua or Cienfuegos	New plan. Cienfuegos bay		444
796	Approaches to Malacca: Cape Rachado to Pulo Undan	Approaches to Malacca:— Pyramid shoal to Pulo Besar		796
2391	Port Barrera or Lanan. Plan on this sheet.	New Chart. Luzon island to Masbate island		3369
2454	Port Bolinao. Plan on this chart	New plan. Port Bolinao		3392
2436	Port Unteng	Unten ko		2436
951	Taize ura and adjacent bays. Plan on this sheet.	Benten saki to Miwazaki		3374
356	Urakami harbour. Plan on this sheet.			
209	Anchorage on the Solomon islands. Plan of Vulavu anchorage on this sheet	New Plan Vulavu anchorage		3391
3199	Anchorage on the Solomon islands. Plan of Ko rig ko lai bay on this sheet.	New Plan. Korrigole harbour		3391

(*J. D. Potter, Agent.*)

Charts that have received Important Corrections.

No. 954, Ireland, west coast:—Achill sound, southern entrance. 2289, Norway:—The Skagerrak. 2842A, Baltic sea. 2331, Baltic sea. Gulf of Finland:—Haugo head to Barö sound. 173, Baltic sea. Gulf of Finland:—Approaches to Helsingfors and Sveaborg. 2224, Baltic sea. Gulf of Finland:—Helsingfors, Sveaborg, and parts adjacent. 2364, Germany, north coast:—Lübeck bay and Femern belt. 2863, East coast of United States:—Cape Fear river. 2677, West Indies. Leeward islands:—Culebra or Passage island. 2452, West Indies, Leeward islands:—Virgin islands, sheet iii. 2002, South America, east coast:—Rio Grande do Sul. 3271, British Columbia:—Alert bay. 2448, British Columbia:—Approaches to Fitz Hugh and Smith sounds. 2463, Alaska:—Port McArthur to Windham bay. 2462, Alaska:—Windham bay to Icy cape. 608, Africa, west coast:—River Gambia entrance. 149, Africa, west coast:—Old Calabar river. 671, Africa:—Plans on the east coast. 2760, Sumatra, west coast. Sheet I:—Acheh head to Tyingkok bay. 709, Sumatra, west coast:—Ujong Masang to Ujong Indrapura. 1696, Eastern Archipelago:—Lombok to Flores. 2195, Celebes:—Sketch-plans of anchorages. 2914, Philippine islands. Palawan island:—Port Princesa. 976, Philippine islands:—Manila bay. 2562, China, south coast:—Canton river with its western branches to Samshui. 2409, China:—west coast of Formosa. 2357, China, north coast:—Ching wang tao road. 3033, South Pacific ocean:—New Hebrides islands and New Caledonia.
(*J. D. Potter, Agent*).

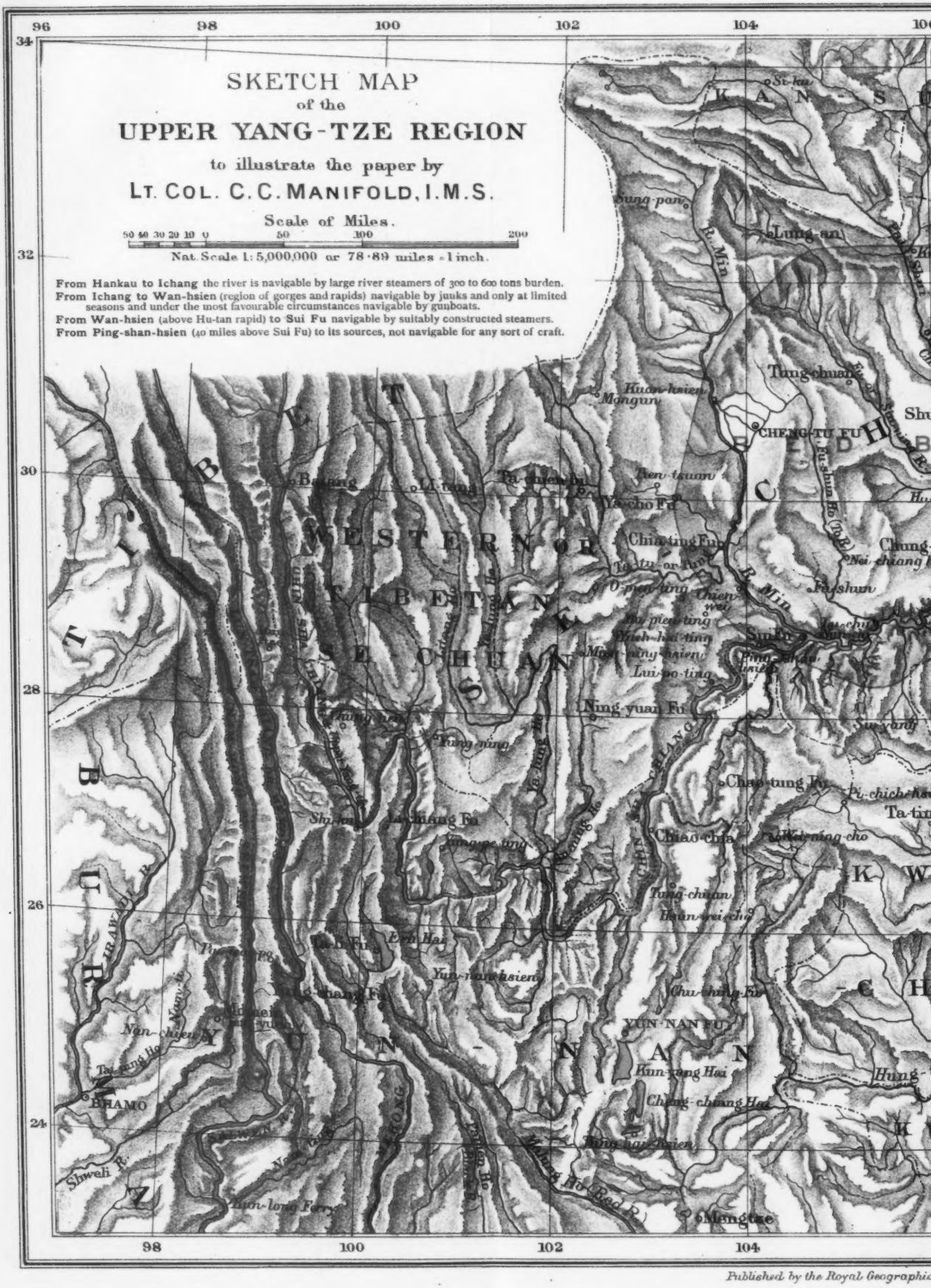
North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for February, 1904. London: Meteorological Office. *Price* 6*d*. *Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for January, and of the North Pacific Ocean for February, 1904. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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UPPER YANG-TZE.
MANIFOLD.

CUMBERLAND WESTMORLAND

2° 37' 2° 36' 2° 35' 2° 34' 2° 33' 2° 32' 2° 31' 2° 30' W.Lon. 2° 29'

Lat 54° 39' 54° 38' 54° 37' 54° 36' 54° 35' 54° 34' 54° 33' 54° 32' 54° 31' 54° 30' Lat 54° 29'

Temple Sowerby
Kirkby Thore
Eden
Morland
Bolton
Kings Meaburn
Sleagill
Maulds Meaburn
Crosby Ravensworth
Lowther
Askham
Lambrigg
Morton Moor
Lowther Park
Lowther Castle
Hackenthorpe
Colby
Appleby
Great Asby
Asby Winderwath Common
Great Asby Scar
Crosby Ravensworth Fell
(Undivided Moor)
Roman Camp
Roman Road
Pa
GH
QP
H

Metalled Roads: First Class
" " Second Class
" " Third Class
Unmetalled Roads
Footpaths

Fenced
Unfenced

GRAPHICAL DISTRIBUTION OF VEGETATION IN THE BASINS OF TE

BY FRANCIS J. LEWIS, F.L.S., UNIVERSITY

WESTMORLAN
W. Lon. 2° 28' 2° 27' 2° 26' 2° 25' 2° 24' 2° 23' 2° 22' 2° 21' 2° 20' 2° 19'
DUFTON
MURTON FELL
BURTON FELL
WARCOP FELL
Great Musgrave
Warcop
Sandford
Soulby
Great Ormside
Brough Sowerby
Church or Chapel with Tower
Spire
without Tower or Spire
Windmill
Letter Box
Contours
Scale of One Inch to One Statute Mile
The Altitudes are given in Feet above the assumed Mean Level of the Sea at Liverpool, which is 0·650 of a Foot below the general
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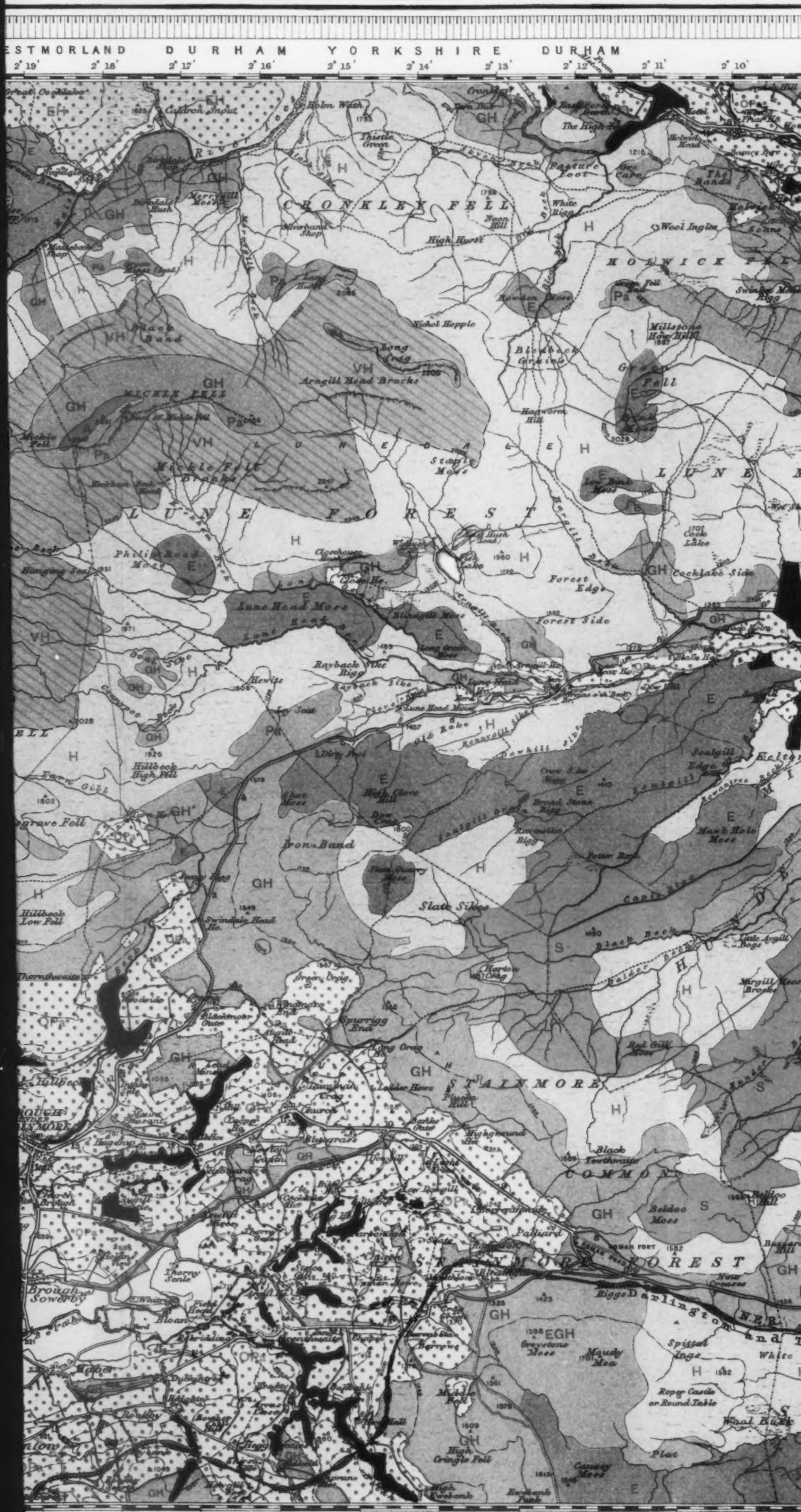
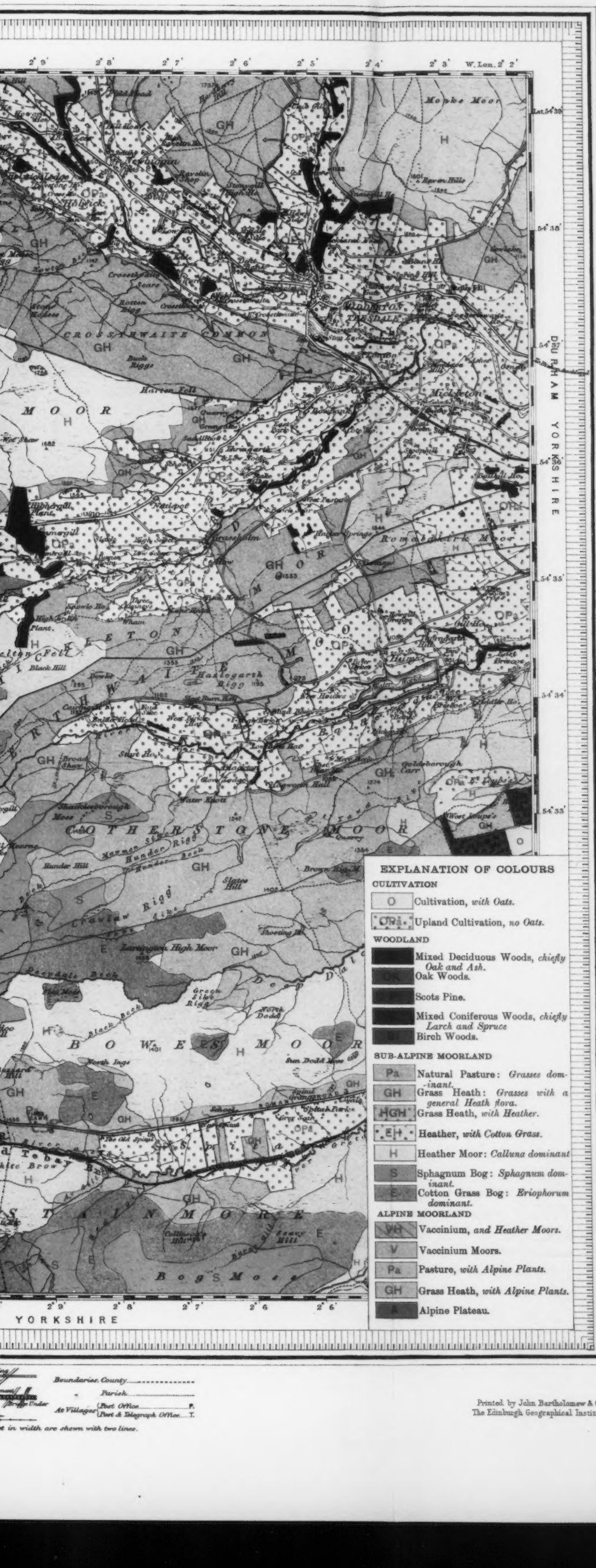
NS OF THE RIVERS EDEN, TEES, TYNE & WEAR - PART I.

NIVERSITY OF LIVERPOOL.


ESTMORLAND
DURHAM
YORKSHIRE
DURHAM
2° 19'
2° 18'
2° 17'
2° 16'
2° 15'
2° 14'
2° 13'
2° 12'
2° 11'
2° 10'
CHONKLEY FELL
HOLWICK FELL
LUNE FOREST
STAINMORE FOREST
STAINMORE COMMON
MICKLE FELL
Black Band
Arngill Head Brecks
Iron Band
Slate Sikes
Hillbeck High Fell
Hillbeck Low Fell
Lune Head Moor
Forest Edge
Forest Side
Cocklake Side
Pasture Foot
White Rigg
High Hurst
Noon Hill
Nicol Hopple
Long Crag
Stagdale Moor
Rayback Rigg
Iron Band
Slate Sikes
Beldoo Moss
Greystone Moss
Maudy Moss
Spittal Inge
Ropey Castle or Round Table
Plain
Caesars Camp
Roman Fort
Roman Road
Brough Sowerby
Thornthwaite
Kirkby Stephen
Tan Hill
Keld
Nine Creases
Black Rock
Little Argill Rigg
Mirgill Head Brecks
Soulgill Edge
Mawk Hole Moss
Red Gill Moss
Dowhill Sike
Soulgill Sike
Old Lake
Lune Head Moor Road
Lune Head Moor
Clayhouse Head
Clayhouse Moss
Fell Lake
Cocklake Moss
Long Grain Moss
Blindgill Moss
Blindgill Head
Arngill Beck
Lune Head Moor Road
Lune Head Moor
Lune Head Moor Road
Lune Head Moor
Philip Head Moss
Hanging Seat
Hewitts
Key Seat
Dibby Rigg
Dibby Head
Tarry Gill
Grave Fell
Thwaite Gill
Thwaite Moss
High Clove Hill
Dew Crag
Iron Band
Flass Quarry Moss
Swindale Head
Swindale Head Ho.
Swindale Beck
Hartley Burn
Hartley Burn Head
Hartley Burn Ho.
Hartley Burn Moss
Hartley Crag
Harter Crag
Harter Fell
Harter Fell Moss
Harter Fell Ho.
Harter Fell Head
Harter Fell Head Moss
Harter Fell Head Ho.
Harter Fell Head Moss
Harter Fell Head Ho.
Harter Fell Head Moss
Harter Fell Head Ho.



EXPLANATION OF COLOURS

CULTIVATION

- O — Cultivation, *with Oats.*
- OPa — Upland Cultivation, *no Oats.*

WOODLAND

- Mixed Deciduous Woods, *chiefly Oak and Ash.*
- OK — Oak Woods.
- Scots Pine.
- Mixed Coniferous Woods, *chiefly Larch and Spruce*
- Bi — Birch Woods.

SUB-ALPINE MOORLAND

- Pa — Natural Pasture: *Grasses dominant.*
- GH — Grass Heath: *Grasses with a general Heath flora.*
- HGH — Grass Heath, *with Heather.*
- EH — Heather, *with Cotton Grass.*
- H — Heather Moor: *Calluna dominant*
- S — Sphagnum Bog: *Sphagnum dominant.*
- E — Cotton Grass Bog: *Eriophorum dominant.*

ALPINE MOORLAND

- VH — Vaccinium, *and Heather Moors.*
- V — Vaccinium Moors.
- Pa — Pasture, *with Alpine Plants.*
- GH — Grass Heath, *with Alpine Plants.*
- A — Alpine Plateau.

Boundaries. County.....
Parish.....
At Villages { Post Office..... P. / Post & Telegraph Office..... T.

t in width are shewn with two lines.

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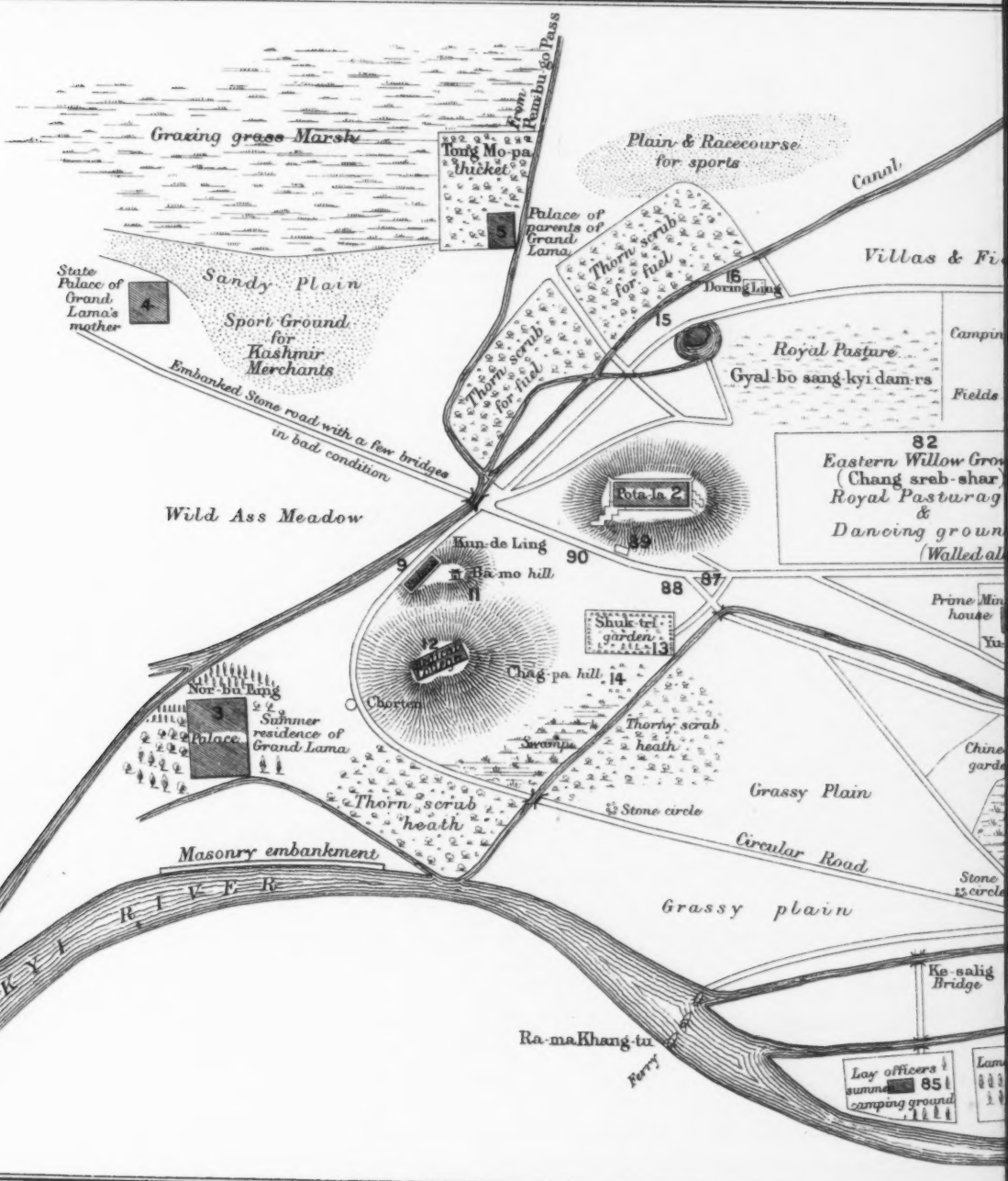
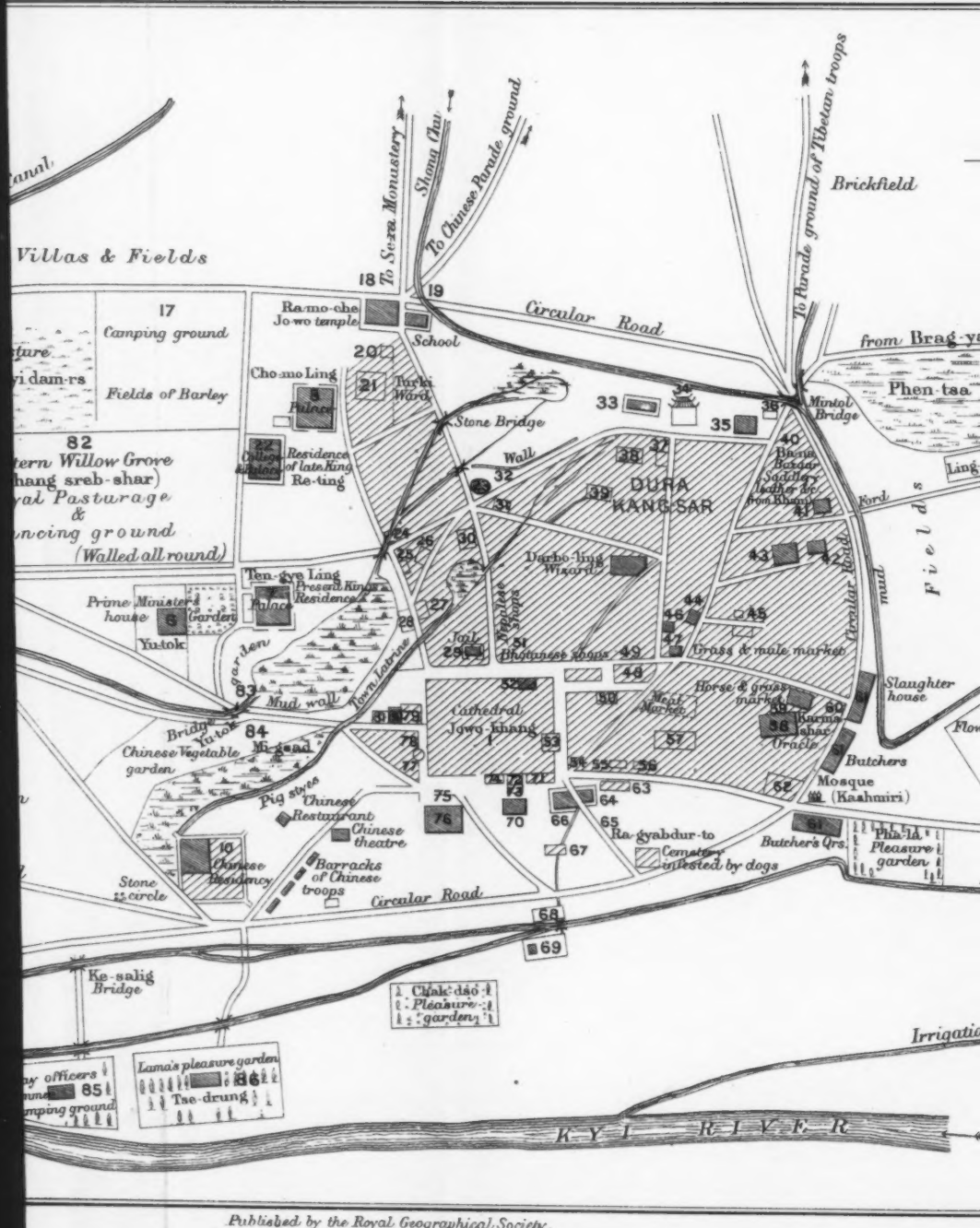
The Edinburgh Geographical Institute

REFERENCES TO
LIEUT.-COLONEL L. A. WADDELL'S
PLAN OF LHASA.

1.—The Great Cathedral, the true **"Lhasa,"** or "place of the gods."
2.—Grand Lama's Palace, **Pota-la.**
3.— Ditto Summer Palace.
4.— Ditto Mother's Palace, for Receptions.
5.— Ditto Parents' Palace, or Paradise **(Lha-lu).**
6.—Prime Minister's **(Kah-lon)** House.
7.—Residence of present King-Regent **(gyal-po).**
8.— Ditto ex-Regent **Cho-mo-ling.**
9.— Ditto ditto **Kun-de-ling.**
10.—Chinese Residency of the Ambans.
11.—Ba-mo **(bong-ba)** Hill, surmounted by Chinese temple.
12.—Chag-ga or Chag-pa Hill, surmounted by Medical School.
13.—Throne Garden, with a stone or brick seat for Grand Lama.
14.—A heath, called the "Centre Snake-waiting," alleged to have been visited by Buddha Sakya Muni.
15.—A Snake-Dragon Temple, surrounded by a moat, and connected by a lock with marsh to the east.
16.—A small stone pillar (? edict) beside residence of the Dung-khor official.
17.—Camping Ground for troops going to the Race-course and Sports in First month of year.
18.—Ra-mo-ché Temple, alleged to be erected by Tara **(Dol-tang)** in Seventh century, A.D.
19.—Upper School of Mysticism.
20.—Temple of the Buddha of Boundless Life.
21.—**Kang-da Khang Sar.**
22.—Residence of the late deposed Regent Re-ting, a lama of Se-ra, who died in banishment to China, about 1860. Now used as an Academy.
23.—Assembly hall of Turki merchants.
24.—"Nam-de-le" Cross-roads.
25.—Residence of Dowager (previous), Mother of Grand Lama.
26.—Chang lo-chen.
27.—Chinese Restaurant.
28.—Tibetan Restaurant.
29.—Jail.
30.—Chinese Torture Chamber.
31.—Pottery Market.
32.—Chinese **Gya-bum gang.**
33.—Lower School of Mysticism.
34.—Miru Temple.
35.—Residence of the General **(Dah-pon)** who visited Darjiling in 1892 (Nga-pö-sa).
36.—Guard-house.
37.—Tannery.
38.—**Phun-kang.**
39.—Astrologer Royal, with about 100 retainers.
40.—Saddlery and Harness Bazaar from Eastern Tibet,
41.—Salutation Point. As here the Pilgrims by the Circular Road catch a glimpse of the Grand Lama's Palace of Pota-la which they salute.
42.—Chinese "Valley" **(Gya-mo rong).**
43.—Grass Market.
44.—Nuns' Restaurant.
45.—Chinese Drug Shop.
46.—Eating House.
47.—Inner Chinese Meat Market with double row of stalls.
48.—Shops of Newars from Nepal.
49.—Rice Market and large Prayer Flag.
50.—Mohamedan Chinese Eating House.
51.—Bhotanese and Chumbi Shops.
52.—Summary Magistrate's Court for Disputes.
53.—**Su-khang.**
54.—**Sur-gyar-khang.**
55.—Large Prayer Flag, "the Eastern Mountain."
56.—Chinese Eating House.
57.—Bankye-Shak **(Phala)** Palace.
58.—Karmashar Oracle.
59.—Horse Market.
60.—Chinese Military Paymaster.
61.—Slaughter House.
62.—Gye-tön jong-pön.
63.—House of Kashmiri Magistrate for Mohamedan Disputes.
64.—**Rab-sal.**
65.—**Kun-sang-tse.**
66.—Shata Palace.
67.—The Lama-Defender of Religion.
68.—Shata-ling.
69.—Nepalese Captain's Summer House
70.—**Sam-dub** Palace.
71.—Old Palace.
72.—**Kah-shag.**
73.—**Gah-ru shar.**
74.—**Song-cho ra,** where Thanksgiving is held in First month.
75.—Square where Whipping is inflicted for Thieving.
76.—Rag-ga-Shag.
77.—Edict Pillar.
78.—White Tara's Shrine.
79.—Dancing Hall.
80.—Lodging House for Tashilhumpo people.
81.—Mi-sad Bridge.
82.—Eastern Willow Grove.
83.—Triad Chaitya.
84.—Turquoise Jewel House.
85.—Summer Garden for Ministers and Civil Officers.
86.— Ditto for Lamas.
87.—Edict Pillar.
88.—Bazaar and Foundry.
89.—Grand Lama's Stables.
90.—Gateway of **Pargo-kaling.**


From Rumbu go Pass
Grazing grass Marsh
Tong Mo-pa thicket
Plain & Racecourse for sports
Canal
Palace of parents of Grand Lama
5
Thorn scrub for fuel
Villas & Fi
State Palace of Grand Lama's mother
4
Sandy Plain
Sport Ground for Kashmir Merchants
16 Doring Ling
15
Royal Pasture
Gyal-bo sang-kyi dam-rs
Campin
Fields
Embanked Stone road with a few bridges in bad condition
82
Eastern Willow Grov
(Chang sreb-shar)
Royal Pasturag
&
Dancing groun
(Walled al
Wild Ass Meadow
Pota-la 2
39
Kun-de Ling
9
Ba-mo hill
11
90
88
87
Prime Min house
Shuk-trl garden
13
12
Chag-pa hill
14
Nor-bu Ling
3
Palace
Summer residence of Grand Lama
Chorten
Swamp
Thorny scrub heath
Chine garde
Thorn scrub heath
Stone circle
Grassy Plain
Masonry embankment
Circular Road
Stone circle
R. Y. I. R. I. V. E. R.
Grassy plain
Ke-salig Bridge
Ra-ma Khang-tu
Ferry
Lay officers summer camping ground
85



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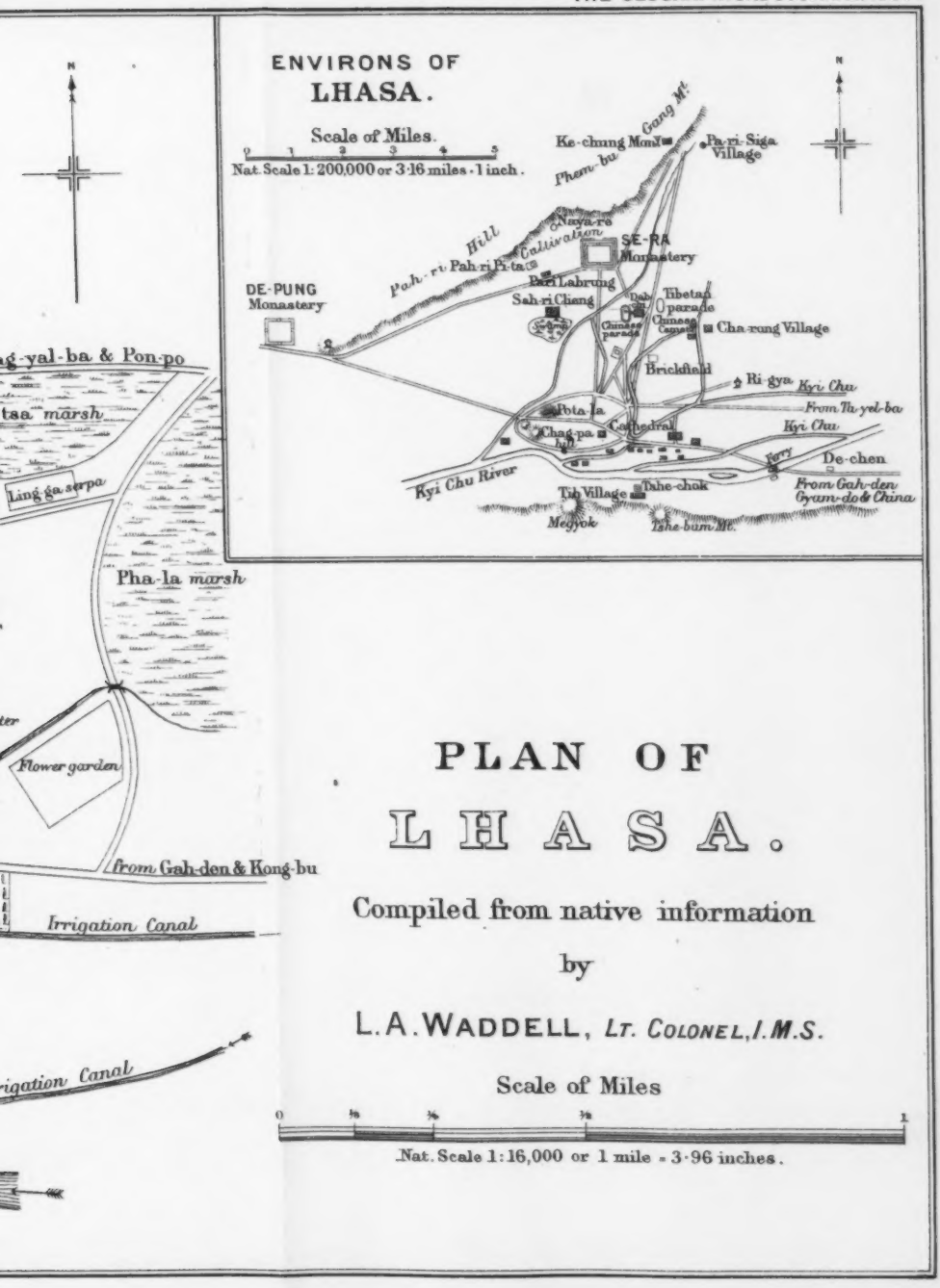

PLAN OF
LHASA.

Compiled from native information

by

L. A. WADDELL, *Lt. Colonel, I.M.S.*

Scale of Miles

0 ⅛ ¼ ½ 1

Nat. Scale 1:16,000 or 1 mile = 3·96 inches.